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THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

AGRICULTURAL RESEARCH ADMINISTRATION

UNITED STATES DEPARTMENT OF AGRICULTURE

SECOND ANNUAL REPORT OF THE SPECIAL COMMITTEE ON THE COORDINATION OF FIELD TESTS WITH NEW FUNGICIDAL SPRAYS AND DUSTS, WITH REFERENCE TO THE RESULTS OBTAINED IN 1948

Supplement 183 April 15, 1949

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

PLANT DISEASE REPORTER SUPPLEMENT

Issued by

THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

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FOREWORD

Most of the committee personnel was continued as in 1947. No work was arranged by the sub-committee on carrots, celery, and onions due to absence from the country of the chairman, Dr. A. G. Newhall. The sub-committee on stone and small fruits did not come to a definite agreement on cooperative plans in time to start the 1948 season and thus have no report for this year. The work on ornamentals was limited to a series of tests on the treatment of gladiolus corms for the control of some of the diseases to which they are subject, and was under the direction of J. L. Forsberg as sub-chairman. The individual members that cooperated in the various sub-committees are listed by the sub-chairmen, whose names are listed below.

Sub-chairmen in charge of crop divisions,--

Apples	J. M. Hamilton	Geneva, New York
Carrots, onions, and celery	A. G. Newhall	Ithaca, New York
Cucurbits	J. W. Heuberger	Newark, Delaware
Ornamentals	A. W. Dimock	Ithaca, New York
Potatoes	W. F. Buchholtz	Ames, Iowa
Stone and small fruits	H. F. Winter	Wooster, Ohio
Tomatoes	M. B. Linn	Urbana, Illinois

Advisory members,--

Agricultural Engineering	Frank Irons	USDA Eng. Lab., Toledo, Ohio
Chemistry	E. G. Witman	Sherwin-Williams Co. Cleveland, Ohio
Experiment Stations, USDA	H. P. Barss	Office of Exp. Stations Washington, D. C.
Entomology	H. F. Dietz	DuPont Company Wilmington, Delaware
Extension	O. C. Boyd	Agric. Exp. Station Amherst, Massachusetts
Industry	L. G. Utter	Phelps Dodge Corp. New York, New York

Plot Design and data analysis	F. M. Wadley	Bureau of Entomology & Plant Quarantine Washington, D. C.
General Chairman	J. D. Wilson	Wooster, Ohio

The Committee wishes to express its gratitude to the following individuals and / or manufacturers who cooperated through the shipment of fungicidal materials to the various cooperators, --

Carbide and Carbon Chemicals Corporation	R. H. Wellman
Dow Chemical Company	W. W. Allen
DuPont de Nemours Company	B. L. Richards
Gallowhur Chemical Corporation	Morton Sorrell
General Chemical Company	J. F. Adams
Goodrich Chemical Company	S. L. Hopperstead
Harshaw Chemical Company	G. M. Juredine
Monsanto Chemical Company	H. E. Bruner
Naugatuck Chemical Company	H. D. Tate
Rohm and Haas Chemical Company	F. B. Maughan
Sherwin-Williams Company	E. D. Witman
Tennessee Copper Company	A. A. Nikitin

J. D. Wilson, General Chairman.

INDEX OF FUNGICIDES AND CROPS ON WHICH THEY WERE USED IN THE VARIOUS TRIALS

Fungicides	Crops
Arasan	Gladiolus
Bioquin	Apples, tomatoes
Bordeaux mixture	Cucumbers, potatoes, tomatoes
341 B	Apples
341 C	Apples
Ceresan N. I. and M	Gladiolus
COC-S	Potatoes, tomatoes
Copper A	Cucumbers, tomatoes
Copper zinc chromate	Cucumbers, potatoes, tomatoes
Cr-1639	Apples
Cuprocide	Tomatoes
Dithane D-14	Potatoes, tomatoes
Dithane Z-78	Apples, cucumbers, potatoes, tomatoes
Dow 9B	Gladiolus
Dowicide B	Gladiolus
F-629	Tomatoes
F-308	Tomatoes
Fermate	Apples, cucumbers
$HgCl_2$	Gladiolus
HL 331	Apples
In 10425	Tomatoes
Karbam	Apples
Lysol	Gladiolus
Mercurated lead arsenate	Apples
Methasan	Tomatoes
Mn carbamate	Apples, tomatoes
Perzate	Apples, cucumbers, gladiolus, potatoes, tomatoes
Phygon	Apples
Phygon XL	Apples, tomatoes
Puratized	Apples, gladiolus
Stanofide	Apples
Sulfurs, various	Apples, cucumbers
Tribasic	Cucumbers, potatoes, tomatoes
Tribasic A	Tomatoes
Zac	Apples, tomatoes
Zerlate	Cucumbers, potatoes, tomatoes

REPORT OF THE SECTION ON FUNGICIDE TESTS FOR THE CONTROL OF APPLE DISEASES, 1948

J. M. Hamilton

Early in the season of 1948, a letter was circularized to twenty-five potential cooperators stating that there would be no cooperative effort suggested for the year but that the results of their experiments would be compiled at the end of the season. The data of fourteen are reported. The comments are given of six others who, for reasons beyond their control, did not have fruit counts. While some of the reports given might well be summarized, it was thought that they were necessary to complete the picture of what happened in 1948. The foliage data not included in this report and the comments as to injury of those who did have scab in their plots were of material value. Omissions and misinterpretations are possible. It is hoped taht the compilation with its shortcomings may be timely and useful.

The effort and good will extended by those taking part in this project are appreciated.

Cooperators

Connecticut - E. M. Stoddard and S. Rich
Delaware - J. W. Heuberger and S. H. Davis
Illinois - Dwight Powell
Indiana - J. R. Shay
Iowa - G. L. McNew and J. L. Hardy
Maine - M. T. Hilborn
Maryland - J. C. Dunegan and M. C. Goldsworthy
Massachusetts - O. C. Boyd
Michigan - Walter Toenjes and A. E. Mitchell
Missouri - H. G. Swartwout
New Hampshire - M. C. Richards and E. J. Rasmussen
New Jersey - R. H. Daines
New York - J. M. Hamilton
D. H. Palmiter
North Carolina - C. N. Clayton
Nova Scotia - J. F. Hockey
Ohio - H. C. Young and H. F. Winter
Ontario - G. C. Chamberlain
Pennsylvania - H. W. Thurston and W. A. Chandler
Virginia - A. B. Groves
West Virginia - C. F. Taylor
Wisconsin - J. Duain Moore

Table 1. Fungicide test on Golden Delicious at Urbana, Illinois, 1948. Dwight Powell.

Treatment	Per cent Scab on Fruit		
	6/24	7/16	10/20
Magnetic "70" 8-100	21	23	38
Fermate 1 1/2-100	7	15	20
Manganese carbamate 1 1/2-100	5	12	30
341C 1 1/2 pt.-100	16	28	51
Bioquin 50W 1-100	7	16	36
Bioquin I, 1/4 + Sulfur 3-100	4	9	16
Puratized 1 pt. -100	4	7	14
Stanofide 1/2 pt. -100	20	20	42
Unsprayed	36	46	89
L. S. D. at 5% level	16.	19.	20.

Six applications of treatments were made, pre-pink through 2nd cover. Lead arsenate 3-100 was used in the calyx and two covers. Lime 3-100 was used with the lead except in the Fermate and Puratized.

Comments:

1. Puratized was the best treatment throughout the season.
2. Fermate allowed serious foliage infection.
3. Manganese carbamate gave cleaner foliage than Fermate but some injury.
4. None of the treatments caused fruit injury.

Table 2. Fungicide test on apples, Barr Orchard, Lake Cicott, Indiana, 1948. J. R. Shay.

Treatment*	Per cent Scab on Fruit at Harvest				
	McIntosh	Grimes	Golden Delicious	Gallia Beauty	Average
Wettable Sulfur 6-100	51	19	37	40	38
Bioquin 50W 1-100	36	38	32	36	35
Phygon XL 3-100	32	23	41	34	32
341C 1 1/2 pt. -100	12	8	11	12	11
Puratized 1 pt. -100	46	20	--	44	36
Fermate 1 1/2 -100	38	24	--	25	28
Manganese carbamate 1 1/2	36	15	--	29	27

*Seven applications as follows: Delayed dormant, pre-pink, bloom, calyx, and 1st, 2nd and 3rd covers. Supplemental sprays include overall wettable sulfur spray in early bloom, and four sprays of 341C at 2-week intervals following 3rd cover.
Lead arsenate and lime were used in calyx and 3 cover sprays.

Fungus and weather conditions:

1. First scab lesions observed May 2 from an infection period of 2 days immediately preceding delayed dormant application, April 15.
2. Dry weather prevailed between delayed dormant and early bloom.
3. Six wetting periods, ranging from 16 to 55 hours each, occurred between early bloom (May 2) and calyx (May 14). Moderate to heavy ascospore discharge and presence of scattered primary lesions during these wet periods resulted in very heavy infection.
4. Dry weather prevailed from calyx until June 6. Practically no spread of disease occurred after mid-June.

Comments:

1. Test rated as poor since protection during the critical late bloom period is all that can be measured.
2. Performance of 341C under these conditions is outstanding.
3. No undesirable effects from four summer applications of 341C noted on fruit. Leaf spotting developed on all varieties as a result of not adding lime to the 341C.

Table 3. Fungicide test on McIntosh in Maine, 1948. M. T. Hilborn.

Sprays applied after infection periods.

Treatment	Per cent Scab on Fruit
Block A	
Mike 8-100	8
Lime Sulfur 8-100 (Mike 8 in covers)	7
Puratized 1 pt. -100 (" " ")	9
Phygon 3/4-100	1
Unsprayed	100
Block B	
Micronized 8-100	4
Good-rite z.a.c. 2-100	3
CR-1639 2-100	5
Bioquin 50W 1-100	1
" " 1/2 + Micronized 4-100	T
Phygon 1/2 + Micronized 4-100	1
" 1/2 + Fermate 1/2-100	1
Unsprayed	64
Block C	
Puratized 1/2 pt. + Fermate 1/2 (Fermate 1 1/2 in covers)	3
Puratized 1/2 pt. + Mike 4 (Mike 8 in covers)	7
Puratized 1/2 pt. + Phygon 1/2 (Phygon 1/2 in covers)	10
Puratized 1/2 pt. + Bioquin 50W 1/2 (B50W 1 in covers)	23

Eight applications were made, 4 pre-bloom, a petal-fall, and 3 cover sprays. Three of the pre-bloom sprays were applied after wetting of 76, 45, and 91 hours.

Fungus and weather conditions:

1. Scab potential high for Blocks A and C, low for B.
2. Six infection periods May 7 to June 5.
3. Scab lesions first observed June 22.

Comments:

1. Test rated good for A and fair for B and C.
2. Phygon caused some foliage mottling in last cover spray.
3. No differences were detected in fruit color and size.

Table 4. Fungicide test on McIntosh at Durham, New Hampshire, 1948. M. C. Richards, E. J. Rasmussen, and Francis Racine.

Treatment	Block A Per cent		Block B Per cent	
	Scab	Russet	Scab	Russet
Micronized 6-100	1	3	1	11
Puratized 1 pt.-100*	1	7	2	15
Fermate 1 1/2-100	4	25	3	29
Phygon XL 3/4-100	1	18	1	10**
Sulfur 3 + Phygon 1/2-100	1	8	1	16**
Fermate 3/4 + Phygon 1/2-100	2	18	1	23**
" " + Manganese carbamate 1/2-100	1	7	4	6
Sulfur 3 + Manganese carbamate 1/2-100	-	-	1	6
Unsprayed	-	-	100	-

*Phygon XL in the 2nd cover spray.
**No Phygon in the calyx or 1st cover sprays.

Seven applications were made between early pre-pink and 2nd cover. Arsenate of lead 2-100 with DDT 2-100 was added in the 1st cover and the DDT was used alone in the 2nd cover.

Fungus and weather conditions:

1. There were 10 infection periods. Block A had one between each of the first 4 sprays, 3 between early bloom and petal-fall, 2 between petal-fall and first cover, and 2 between 1st and 2nd covers. Block B had approximately 2 between each application.
2. First scab appeared May 27 (mid-bloom).

Comments:

1. Severe frost damage to foliage in early season, trees in low vigor, and latter part of season dry.

2. Moderate to severe injury in Phygon plots.
3. There was an increase in Phygon injury to fruits with sulfur or Fermate mixtures.
4. Fermate did not give a good performance.

Table 5. Fungicide test on Delicious in New Jersey, 1948. R. H. Daines.

Treatment	Per cent Scab on Fruit
Lime Sulfur 2-100*	4
Micronized 6-100	4
" 3 1/2 + Fermate 1/2-100	4
Fermate 1 1/2-100	4
Manganese carbamate 1 1/2-100	3
Copper 8 1-100	3
341C 1 1/2 pt.-100	4
Puratized 1 pt.-100	1
HL331 1/2 pt.-100	1
Phygon 3/4-100	2
Unsprayed	100

*Micronized sulfur replaced lime sulfur during 4th cover spray. Fermate replaced sulfur sprays in 5th cover.

Three pre-bloom, a petal-fall, and 5 cover sprays were applied. All sprays applied on 7-day schedule through 2nd cover. Potential inoculum was high. Remaining 3 covers applied on 10-day schedule. Arsenate of lead used in petal-fall and 1st cover applications. DDT used in remaining cover sprays.

An infection period occurred at the squirrel's ear stage and eight during the time that cover sprays were used. The wet periods were distributed quite evenly through the cover period.

Comments:
1. Organic mercury fungicides caused some yellow leaves following the 3rd, 4th, and 5th cover sprays.
2. Phygon seemed to affect fruit set adversely.
3. The 341C and Phygon caused 12 and 33 per cent fruit russet, respectively.

Table 6. Fungicide test on McIntosh, Brownlee Orchard, Geneva, New York, 1948. J. M. Hamilton.

Treatment	Block A Per cent Scab on Fruit
Micronized 5-100	39
" 8-100	38
Everett Flotation Sulfur Paste 10-100	33
" " " " 6 + p.e.p.s. 1/2-100	45
Magnetic "70" 7-100	26
Flo-Sul "70" 7-100	74
G.L.F. #4 5-100	55
Magnetic "95" 5-100	55
Mike 5-100	66
Fermate 1 1/2-100	5
Unsprayed	100

Nine applications made between pre-pink (April 27) and 4th cover (August 4). Bordo-oil and Puratized applied in green-tip and delayed dormant, respectively. Lead 3-100 used in 4 sprays after petal-fall. No lime added. DDT put on in 2nd and 4th covers. Grasselli Spreader-sticker added in cover sprays to all but Fermate where B1956 was used.

Comments:

1. Carry-over of inoculum moderate.
2. There were 17 infection periods by August 4 with 14 inches of rain.
3. Scab observed 10 days after petal-fall (May 27).
4. Check trees heavily scabbed early in season.
5. Not much scab development after 2nd cover, July 2.
6. Everett Paste caused a yellow chlorotic type of injury. All dry wettables injured the foliage in the early sprays.
7. Two-spotted mite was serious on Fermate trees.
8. Most of scab on fruit appeared at one time. June drops had same percentage of scab as picked fruit.

Table 7. Fungicide test on McIntosh, Brownlee Orchard, Geneva, New York, 1948. J. M. Hamilton.

Treatment	Block B Per cent Scab on Fruit
Micronized 5-100	18 (7)*
341B 2-100	4
" " + p.e.p.s. 1/2-100	6
341C 1 1/2 pt.-100	2
" " + Lime 3-100	8
Good-rite z.a.c. 1/2 + p.e.p.s. 1/2-100	38
Z78 1-100	33
Fermate 1 1/2-100	5
CR-1639 1 1/2 pt.-100	15
Unsprayed	100

*The micronized trees by the glyoxalidine and z.a.c. treatments had 7 per cent scab.

Eight applications made between pre-pink and 2nd cover. Bordo-oil and Puratized applied in green-tip and delayed dormant, respectively. Micronized put on whole block in 4th cover. Lead 3-100 used in 5 sprays following bloom. Lime 3-100 used except in 341C alone and carbamates. DDT applied in 4th cover.

Comments:

1-5. Same as for Brownlee sulfur Block A.
6. The 341C alone caused more russet than 341C with lime but this was not apparent at harvest.
7. Fruit sprayed with 341C scalded as did those with sulfur.
8. The foliage of the micronized and 341B plots had more scab than that of 341C.
9. CR-1639 caused severe injury prior to the cover sprays.
10. CR-1639 not compatible with Z78.

Table 8. Fungicide test on McIntosh, Brownlee Orchard, Geneva, New York, 1948. J. M. Hamilton.

Sprays delayed until infection periods occurred.

Treatment	Per cent Scab on Fruit	
	McIntosh	Cortland
Bioquin 50W 1-100	31	16
" " " + p.e.p.s. 1/2	13	9
Puratized A 1 pt.-100	26	20
Puratized B 1 pt.-100	4	2
HL331 1/2 pt.-100	6	3
" 1/4 pt. + Micronized 3-100	6	5
Puratized A 1/2 pt. + " "	15	16
Phygon XL 1/2-100	23	20
" 1-100	8	10
Phygon XL-CS 1/2-100	40	47
" " 1-100	8	10
" " 1/4 + Micronized 3-100	26	16
" " 1/4 + Fermate 3/4-100	14	10
Fermate 1 1/2-100	21	15
" 3/4 + Manganese carbamate 3/4-100	10	12
Micronized 3-100	67	71
" 6-100	47	39
Unsprayed	100	100

Five applications of treatments, pink to 1st cover, applied after infection periods of 40, 33, 35, 52, and 50 hours.
Bordo-oil and Puratized put on at green-tip and delayed dorment, respectively. Micronized 3-100 used in 2nd and 4th covers. Lead 3-100 added in 5 sprays after bloom. Lime 3-100 was included in all but the carbamates. DDT substituted in 4th cover. Phygon XL-CS is Phygon XL with calcium sulphate.

Comments:

1. Good test - moderate carry-over of scab.
2. Two applications saved by waiting for infection periods.
3. Fifteen infection periods with 10 inches of rain to 2nd cover, July 8.
4. Scab observed 10 days after petal-fall (May 27). Checks heavily scabbed early - little scab development after 2nd cover.
5. Foliage of Puratized B looked tough at 1st cover. Yellow cluster leaves on HL331 trees.
6. Moderate mottling of foliage and bursting of terminal buds with Phygon.
7. Scab lesions appeared on the foliage of Phygon and phenyl mercury materials July 1 but did not sporulate.

Table 9. Fungicide test on McIntosh, Station Orchard, Geneva, New York, 1948. J. M. Hamilton.

Sprays delayed until infection periods occurred.

Treatment	Per cent Scab on Fruit
Puratized 1/2 pt.-100	29
" 1 pt.-100	18
Puratized 1/2 pt. + Micronized 3-100	21
" 1 pt. + " "	8
HL331 1/2 pt.-100	2
" " + Micronized 3-100	1
" " + Micronized 6-100	1
Micronized 3-100	58
" 6-100	22

Five applications made between pre-pink and 1st cover after infection periods of 62, 33+, 61+, 56, and 50 hours. Lime sulfur 1-50 put on early delayed dormant and Fermate 1 1/2-100 in 2nd cover. Four applications of lead 3-100 with no lime made after bloom. DDT used in last spray.

Comments:

1. Good test - moderate carry-over of scab.
2. The 5 applications cover the primary infection period.
3. Fifteen infection periods with 9.6 inches of rain to 2nd cover, July 6.
4. Scab was heavy on sulfur foliage and light on Puratized. HL331 foliage was clean.
5. The Puratized and HL331 without lime in this block had cleaner foliage than with lime in the Brownlee block.
6. Injury characterized by rings of russet did occur but was not serious.

Table 10. Fungicide test on apples, McKiernan Orchard, Rock City, New York, 1948. D. H. Palmiter.

Treatment	Per cent Scab on Fruit McIntosh	Cortland	Delicious
40% Flotation Sulfur Paste 10-100 ..	44	--	--
60% " " " 7-100 ..	46	--	--
Micronized Sulfur 5-100	22	10	16
Micronized 5 + p.e.p.s. 1/2-100	26	--	--
Puratized A.S. 1 pt.-100*	12	8	11
Puratized B 1 pt.-100*	26	24	15
HL331 1/2 pt.-100*.....	7	4	1
Fermate 1 1/2-100	7	--	--
" 3/4 + Phygon (1947) 1/4-100**	4	4	0

	Per cent Quince Rust Cortland	Delicious
Micronized Sulfur 5-100	6	9
Puratized A.S. 1 pt.-100*	5	22
Puratized B 1 pt.-100*	7	20
HL331 1/2 pt.-100*	3	11
Fermate 3/4 + Phygon (1947) 1/4-100**	0	0

*Micronized sulfur substituted for organic fungicide in the cover applications.

**Phygon omitted in the cover applications and Fermate used at 1 1/2-100.

Lead arsenate 3-100 used without lime from calyx to 4th cover.

Ten applications were made between delayed dormant and 4th cover.

Comments:

1. Carry-over of inoculum was heavy.
2. Test rated as good. There were 14 infection periods with a total of 14.8 inches of rain.
3. No secondary infection due to dry weather after June.
4. Sulfur plots showed considerable sunscald and marginal leaf injury. General yellowing of the foliage of the sulfur-sprayed trees was in contrast with the greener foliage of the trees sprayed with organic fungicides.
5. Some marginal leaf injury from the use of lead arsenate without lime in plots sprayed with the organic mercury fungicides.

Table 11. Fungicide test on McIntosh, Harris Orchard, Poughkeepsie, New York, 1948. D. H. Palmiter.

Treatment	Per cent Scab on Fruit
Micronized Sulfur 6-100	21
Micronized 3 + Parzate 1-100	5
" 3 + Z78 1-100	5
" 3 + Karbam 1-100	4
" 3 + Manganese carbamate 1-100	5
" 4 3/4 + Phygon (1947) 1/4-100	2
" 5 + p.e.p.s. 1/2-100	16

Nine applications between delayed dormant and 3rd cover. Sulfur on all plots in 4th cover. Lead was used without lime from petal-fall through 1st cover (4 sprays). DDT was substituted in the next 4 covers.

Comments:

1. Carry-over of inoculum was abundant and test good.
2. There were 17 infection periods with 12.2 inches of rain.
3. Scab was first seen on spur leaves at bloom.
4. Check trees had dropped all fruit and most leaves by 1st cover.
5. No secondary infection occurred due to dry weather after 2nd cover.
6. The Phygon-sulfur plots looked good early in the season but showed browning of the foliage with hot weather. Fruits were small, of poor color, and dropped early.
7. The Parzate-sulfur mixture caused severe fruit russet (June 15). The Z78-sulfur mixture caused an occasional russeted fruit.
8. Both the iron and manganese carbamate-sulfur combinations looked good with little injury and the best fruit color.

Table 12. Fungicide test on McIntosh, Zimmer Orchard, Poughkeepsie, New York, 1948. D. H. Palmiter.

Treatment	Per cent Scab on Fruit
Flotation Sulfur Paste 10-100*	13
Puratized 1 pt.-100**	5
" 1/2 pt. + Fermate 1/2-100**	3
Fermate 1 1/2-100	3
" 3/4 + Phygon (1947) 1/4-100	4
Bioquin 50W 1-100	12
Manganese carbamate 1 1/2-100	28

*Dry lime sulfur used to burn out scab lesions at first cover, June 4.
**Fermate 1 1/2-100 was substituted after 1st cover 18 days after petal-fall.

Seven applications made between pre-pink, April 23, and 2nd cover, June 28. Dry L-S or Puratized 806 applied in delayed dormant. Lead used from petal-fall through 1st cover (4 sprays) and DDT in 2nd to to 5th covers.

Comments:

1. Carry-over of inoculum was moderate and test good.

2. There were 17 infection periods with 15.2 inches of rain.
3. Scab was first observed just before bloom.
4. Check trees had dropped all fruit and many leaves by 1st cover.
5. No secondary infection due to dry weather after 2nd cover.
6. Puratized trees matured fruit later than the rest.
7. Everett Flotation Paste caused yellow foliage and sunscald.
8. Foliage of Phygon-sprayed trees turned brown during hot dry weather before other materials.
9. Bioquin 50W caused severe russet injury on fruit.
10. Heavy fruit drop occurred on the Manganese-carbamate and Phygon-Fermate plots.
11. Parzate was discontinued after the 10-day spray, May 27, due to severe fruit russet and poor scab control.
12. CR-1639 emulsion (1 1/2 pt.-100) or powder (2-100) caused both fruit and leaf injury. The powder at 1-100 with Fermate 3/4-100 was used after bloom without injury.

Table 13. Fungicide test on apples, Kentville, Nova Scotia, Canada, 1948. J. F. Hockey.

Treatment (Imperial Gallon)	Per cent Scab on Fruit
Crimson Gravenstein	
Fermate 1 3/4-100	12
Flotation Sulfur 15-100	13
Sulforon X 8-100	19
341C 1 3/4-100	11
Phygon 1-100	20
Mercurated Lead Arsenate 2 1/2-100	46
McIntosh	
Fermate 1 3/4-100	43
Lime Sulfur 1 1/2 gal. + Iron Sulfate 6-100	11
341C 1 3/4 pt.-100	45
Phygon 1-100	40

Fungus and weather conditions:

1. Rainfall was 10.4 inches for May and June. A 54-hour infection period at 60°F. occurred at the start of bloom and a 76-hour infection period just before petal-fall. There were many wetting periods of 15 to 20 hours.
2. Foliage scab was first observed as the trees came into bloom.

Comments:

1. Test was not completely satisfactory as there was too much variation between count trees. Spraying conditions were difficult.
2. Red mite and oyster shell scale were present on fruit from the

Phygon plot, but none was observed on the 341C plot. There was a trace of red mite on Fermate-sprayed fruit.

3. No foliage or fruit injuries observed except a slight chlorotic flecking of the foliage on the mercurated lead arsenate plots.

Table 14. Fungicide test on Rome Beauty, Melrose Orchard, Wooster, Ohio, 1948. H. C. Young and H. F. Winter.

Treatment	Per cent Scab on Fruit
Micronized 6-100 (covers 5-100)	3
" " + p.e.p.s. 1/2 (covers 5-100	2
Mike 6-100 (covers 5-100)	6
" " + p.e.p.s. 1/2 (covers 5-100)	4
Flotation 12-100* (covers 8-100)	4
" " + p.e.p.s. 1/2 (covers 8-100)	6
Magnetic "70" 8-100* (covers 5-100)	6
Good-rite z.a.c. 1 1/2 + p.e.p.s. 1/2-100	4
Fermate 1 1/2-100	8
341C 1 1/2 pt. + Lime 3-100	8
Phygon 3/4-100 (Mike 5 after 1st cover)	10
" 1/2 + p.e.p.s. 1/2 (Mike 5 after 1st cover)	7
Puratized 1 pt. -100 (" " " ")	5

*Flotation 10 and Magnetic "70" 6 1/2 were used in petal-fall.
Eight spray applications were made from the pre-pink, April 19, to July 28. Arsenate of lead was used in petal-fall and cover sprays.

Comments:

1. Test rated as fair. Scab infection primary.
2. The 341C caused foliage injury and fruit russet.
3. The z.a.c. with p.e.p.s. caused foliage injury.

Table 15. Fungicide test on McIntosh, Dominion Laboratory Orchard, St. Catharines, Ontario, Canada, 1948. G. C. Chamberlain.

Treatment (Imperial Gallon)*	Per cent Scab on Fruit
Block A	
Magnetic "95" 8-100	58
Mike 8-100	52
Mulsoid 8-100	52
Microflotox 8-100	44
" " + Orthex 1 pt. -100	29
" " + p.e.p.s. 1/2-100	27
Magnetic "70" 9-100	31
Flotation Paste 15-100	57
Fermate 2-100	13
341C 1 3/4 pt. + Lime 1-100	5
Phygon 1-100	6
HL331 1/2 pt. -100	2
Block B	
Microflotox 8-100	35
Lime Sulfur 1-60	25
Phygon 1-100	1
341C 1 3/4 pt. + Lime 1-100	3
Puratized 1 pt. -100	10
HL331 1/2 pt. -100	2
Unsprayed	100

*Block A: Three pre-bloom, one bloom, calyx, and two cover sprays were applied. Bordo 2 1/2-5-100 replaced Puratized, HL331, and lime sulfur in the 2nd cover spray. Block B: The pre-pink and pink applications, as in Block A, were omitted and two bloom sprays were followed by the cover sprays.

All plots received 2 additional cover sprays of Fermate 1-100. The dry wettable sulfurs were reduced in the cover sprays to 6-100; Magnetic "70" to 6-100; Flotation Paste to 10-100; and Fermate to 1-100.

Fungus and weather conditions:

1. Carry-over of inoculum was considered light.
2. Ascospore discharge commenced at pre-pink (April 24).
3. Important infection period occurred during repeated showers at full pink and partial bloom (May 10-14). Secondary infections took place June 7-9 and June 22-24.
4. Primary infection was observed at the calyx stage, May 28.
5. Summer weather was very dry.

Comments:

1. High incidence of scab provided a critical test. The organics were decidedly more effective than the sulfurs.

2. HL331 was outstanding in performance.
3. Compound 341C and Phygon provided excellent control. Both materials caused excessive fruit russeting. Foliage injury occurred on the Phygon trees.
4. Fermate gave only mediocre control of foliage scab but little infection develped on the fruit.

Table 16. Fungicide test on apples, State College, Pennsylvania, 1948. H. W. Thurston and W. A. Chandler.

Treatment*	Per cent Scab on Fruit	
	McIntosh	Stayman Winesap
341C 1 1/2 pt. -100	18	6
LS 1-50 before bloom - 341C 1 pt.-100 after ..	32	10
LS 1-50 " " - Flotation 10-100 after.	31	6
Bioquin 50W 1-100	73	28
Unsprayed	100	100

*Nine applications made between delayed dormant and 4th cover. Sprayed at intervals of one week through 1st cover.

Fungus and weather conditions:
1. Two or more infection periods occurred between each spray between the pre-pink and first cover.
2. Scab appeared on spur leaves at petal-fall (May 12).

Comments:
1. Flotation caused foliage injury.
2. The 341C gave a better looking foliage than sulfur or Bioquin.
3. The 341C-sprayed foliage showed lowest red mite count.
4. Bioquin 50W gave rather poor performance.

Table 17. Fungicide test on apples, Tuttle Orchard, Stephens City, Virginia, 1948. A. B. Groves.

Treatment*	Per cent Scab			
	York		Jonathan	
	Foliage	Fruit	Foliage	Fruit
Fermate 1 1/2-100	16	2	2	0
341C 1 qt. + L 1/2-100	5	2	1	0
Bioquin 50W 1-100	12	1	2	0
Phygon XL 3/4-100	1	0	T	0
Puratized 1/2 pt.**	7	2	3	0
Unsprayed	81	83	57	6

*Nine applications were made: Pre-pink, pink, petal-fall, and 6 cover sprays (first seven sprays at 14-day intervals). DDT was used in all

sprays after bloom.
**Manganese carbamate substituted for Puratized after 2nd cover.

Fungus and weather conditions:
1. Carry-over of inoculum light to moderate.
2. Major ascospore discharges occurred at pre-pink, pink, and between petal-fall and 1st cover.
3. Abundant source of conidia for secondary infection at 1st cover.
4. Rainfall was frequent during May and June.

Comment:
1. Fruit russet occurred in all plots other than those of Fermate and Puratized.

Table 18. Fungicide test on Starking in West Virginia, 1948. C. F. Taylor.

Treatment	Per cent Scab	
	Foliage	Fruit
Section A		
Flotation 6 + Fermate 3/4-100*	30	16
Fermate 1 1/2-100	50	18
Phygon 3/4-100**	49	39
Phygon 3/4-100*	64	46
Puratized 1/2 pt. + Fermate 3/4-100*	43	16
Section B		
341C 1 qt.-100**	2	5
Bioquin 50W 1-100**	42	16
Micronized 6-100***	30	32
Puratized 1 pt.-100**	44	44

*Materials 4 sprays - Fermate 1 1/2 three sprays.
**Materials 6 sprays - Fermate 1 1/2 last spray.
***Micronized 6-100 in pink and calyx and 5-100 in 1st 2 covers. Bordo (1/2-2) 2 sprays and Bordo (2-4) last spray.
Seven applications between the pink and the 5th cover. The first four sprays (pink, calyx, and 2 covers) were the important sprays.
Two infection periods before treatments began. Block B same as Block A except the treatments under Block B were delayed 4 days at 1st cover, May 6 to May 10, with intervening infection.

Comments:
1. Crop light and irregular due to frost.
2. The 341C was outstanding in the control of scab.
3. Phygon caused excessive russet when used later than 2nd cover.
4. Bioquin 50W was more effective against fruit scab than against leaf scab.

Table 19. Scab control on Delicious and Stayman with a ground spray of Elgetol and a foliage spray of Puratized at petal-fall, U. S. D. A., Beltsville, Maryland, 1948. M. C. Goldsworthy and J. C. Dunegan.

Treatment*	Per cent Leaf Scab	Per cent Fruit Scab	Degree Infection
	Delicious		
Unsprayed	92.6	61.0	Heavy
Puratized 1 pt.-100	13.0	16.2	Light
	Stayman		
Unsprayed	92.8	70.0	Heavy
Puratized 1 pt.-100	22.4	2.0	Light

*All plots received ground spray of Elgetol 1/2% - 400 gallons per acre on March 30.
The Puratized 1 pt.-100 gallons was applied at petal-fall (April 22). Lead arsenate 2-100 and DDT 2-100 were used in the first 2 covers (May 4 and 17).

Comment:
1. Apple scab was very severe in the area this season and many orchards were defoliated early.

Connecticut - E. M. Stoddard and S. Rich.

They deduced from scab counts made on the foliage of Dwarf McIntosh that Phygon XL and Puratized were more effective when used alone than when used in a split schedule with Fermate. Z78 and 341C were rated as unsatisfactory for scab control. The counts did not show any appreciable value from mixing sulfur and Fermate.

Delaware - J. W. Heuberger and S. H. Davis.

In a primary leaf infection count made on Delicious, Bioquin I 1-100, Puratized 1 pt.-100, and liquid lime sulfur 1 1/2 gal.-100 were about comparable but all were inferior to Magnetic "70" 8-100. Puratized 2 pt. -100 gave the same protection as the Magnetic "70."

Iowa - G. L. McNew and J. L. Hardy.

Scab control based on the primary infection of the foliage of Jonathan and Starking indicates that Phygon XL and AL were both consistently effective even at 6/16-100. Secondary infection was consistently lowest on trees sprayed with Puratized. Puratized, Phygon XL, and dry lime sulfur were more effective than Fermate, 341B, 341C, and the wettable sulfurs.

Massachusetts - O. C. Boyd.

The fruit on all the plots were practically clean, probably due to

a light carry-over of inoculum. A tighter than usual cover-spray schedule failed to prevent secondary spread of scab on leaves in the micronized plot. Secondary infection occurred in the Fermate-p.e.p.s. plot in late August. The foliage remained free of scab in the Puratized A and B, HL331, and Phygon plots.

Phygon XL caused leaf chlorosos as in 1947. Puratized B stunted the leaves, causing the trees to look thin or scanty of foliage. Fruit set was distinctly lighter in the Phygon plots than for the other materials. The bestlooking foliage and fruit occurred in the micronized and Fermate rows.

The least fruit russet occurred in the micronized 6-100 and Fermate 1 1/2-p.e.p.s. 1/2-100 plots and the most in those of the Phygon XL (3/4-100) and Puratized B (1 pt.-100). Magnesium sulfate reduced Phygon chlorosis in leaves and russet on fruit. HL331 (1/2 pt.) and Puratized (1 pt.) caused only slightly more russet than micronized and Fermate.

Missouri - H. G. Swartwout.

The season of 1948 was such that little scab developed. Delicious, Jonathan, and Ben Davis sprayed with arsenate of lead in the calyx, first cover, and second cover were almost free of sooty blotch and fly speck at harvest time, while those sprayed with DDT were heavily infected with the diseases. Trees sprayed in the pre-pink, pink, and calyx periods with Puratized 1 pt. had considerably less of these two diseases than trees which received wettable sulfur in these same applications.

Virginia - A. B. Groves.

Compatibility of some organic fungicides and insecticides:

(a) Scab Control:

Fermate. The fungicidal effectiveness of Fermate was reduced by Parathion and Neotran, was unaffected by IN-4200, and was fortified by DN-111.

Phygon. Scab control was good in all plots with probably significant reduction in effectiveness by Neotran. Injury was so severe, however, that this consideration was unimportant.

Puratized. It was not seriously affected by any combination although scab control was poorer when used with IN-4200.

Manganese carbamate. It did not hold secondary scab satisfactorily. Parathion reduced its effectiveness.

Bioquin 50W. Scab control with Bioquin was significantly reduced by Neotran and DN-111.

Compound 341C. Effectiveness against scab was reduced by Neotran and improved by IN-4200 and DN-111. This latter effect may have been due to a shock effect with appreciable loss of foliage.

(b) Safety:

Fermate. No injury occurred when Fermate was used in combination with Parathion, Neotran, or DN-111. Injury with IN-4200 was severe, as it was in all plots where it was used.

Phygon. Some typical Phygon spotting occurred in all plots but it was not serious. All miticides caused a significant increase in fruit injury, least with Parathion.

Puratized. All injuries where this material was used were attributable to the miticide. There was a noticeable development of yellow leaves early in the summer where Puratized was used, but no count was made as the trouble did not reappear after these first affected leaves fell.

Manganese carbamate. It did not appear injurious in any miticide combinations or alone.

Bioquin 50W. Jonathan were seriously russeted when Bioquin 50W was used in an all-season schedule, in all combinations and alone. Injury on the York was less severe. It was most aggravated by Parathion and Neotran.

Compound 341C. Produced some injury when used alone and was not significantly affected by Parathion or DN-111. Injury was severe with Neotran and IN-4200.

Wisconsin - J. Duain Moore.

There was no difference between treatments in tests on McIntosh. An objectionable amount of leaf injury occurred on the 341C plots. The trees sprayed with Phygon in 1947 failed to develop fruit buds for the 1948 season.

Conclusions

Wettable sulfurs, as a group, gave poor control of apple scab, particularly in comparison with the organics. This is attributed to insufficient retention and poor timing or lack of protection at the critical infection periods. Magnetic "70" was the most effective. Comparatively high concentrations or the addition of stickers did not sufficiently improve the scab control. The performance of p.e.p.s. was inconsistent and in no instance outstanding. The mixture of sulfur with a carbamate, Phygon, or phenyl mercury compound has definite possibilities. Wettable sulfurs were effective if the carry-over of inoculum was small, the variety resistant, the timing good, or the test was not otherwise critical, as indicated by low check counts.

Fermate, in general, was decidedly more effective than the wettable sulfurs, which is difficult to explain. This is the first year in which this has occurred. As in previous years, it gave better control of scab on the fruit than on the foliage. The addition of Fermate to Puratized and Phygon increased their protective function. Fermate materially re-

duced the effectiveness of Puratized and HL331 and, to some extent, that of Phygon, when the mixtures were applied after infection periods. It did act as an arsenical corrective when added to Puratized. The mixture of Fermate and Phygon appears to be the safest way to use Phygon but applications should not be made in the cover sprays. Manganese bis dithiocarbamate is probably somewhat inferior to Fermate in scab control, but the data are not entirely consistent. The mixture of this material with Fermate is of questionable value. Parzate caused severe injury to the fruit. Two-spotted mite was serious on the carbamate, Phygon, and Bioquin 50W trees. Good-rite z.a.c. has given indication of warranting field tests but, unfortunately, none of the experiments in 1948 showed its possibilities. It is thought that the formula in 1948 was such as to give poor retention.

Bioquin 50W at 1-100 was not adequate for scab control in critical tests although it was much improved with the addition of a sticker. It will not be available for further testing. Severe injury occurred when lime was omitted.

The Compound 341C gave remarkably good scab control in most critical tests although, for some reason, it was not effective in others. There were instances of foliage injury and severe fruit russet. Scab control was obtained without the addition of lime. There is indication that it might control red mite. The 341B can be considered to give adequate conditions.

Phygon 1/2-100 was not strong enough to control scab except under favorable conditions. Evidently, Phygon 1-100 was not too effective when it functioned as a protectant under considerable rainfall. Phygon, not unlike Puratized, gave better scab control when the rainfall was low or when applied after infection periods. There is something to be said for the addition of Phygon one-half strength to wettable sulfur or, perhaps better yet, Fermate when the applications are made after wetting periods. One cannot expect maximum results with any of the materials after lengthy wetting periods, except at full strength. Phygon caused too much foliage injury and there were instances of rather severe russeting of the fruit. Fruit drop was serious with late applications. Phygon caused the terminal buds to prematurely burst. Trees sprayed with it in 1947 in Wisconsin and New York failed to bear a crop of fruit in 1948. Even if a corrective that would eliminate injury were found, there might be some question as to the effectiveness of Phygon when applied after wetting periods. Phygon did not have a good year in 1948.

Puratized Agricultural Spray is not a good protectant, but it may be expected to give fair results when applied after infection periods. Lesions may become visible and not bear conidia. Puratized is most effective when mixed with sulfur and Fermate, but the latter may not control scab when applied after lengthy wetting periods. Puratized B

was more effective than the Puratized A in one instance but less in another. It is more injurious.

HL331 (Tag Fungicide No. 331) gave the most consistent performance of any of the materials considered when applied after infection periods. It was reasonably compatible with most materials. It appeared to be more effective than Puratized against quince rust. Some injury occurred on fruit and foliage but this is not considered a serious factor at this time. HL331 would appear to be the most promising material of 1948.

CR-1639 (emulsion) was definitely fungicidal, but it caused too much injury, particularly when applied before the cover sprays. The dry form was safer, but the indication it that it is not as effective, particularly when applied after wetting periods.

Scab control obtained on Delicious and Stayman with a ground spray of Elgetol and a foliage spray of Puratized at petal-fall suggested possibilities for such a combined program. It could be said that the application of Puratized was fortunately at a most critical time.

REPORT OF THE NATIONAL CUCURBIT FUNGICIDE TEST--1948

J. W. Heuberger

The following plant pathologists cooperated in the test on the following crops:

Cooperators	State	Crops
J. G. Atkins	Louisiana	Cucumbers
C. E. Cox	Maryland	Cantaloupes
D. J. deZeeuw	Michigan	Cucumbers and Cantaloupes
D. E. Ellis	North Carolina	Cantaloupes and Watermelons
W. M. Epps	South Carolina	Cucumbers
J. W. Heuberger	Delaware	Cucumbers and Cantaloupes
J. D. Wilson	Ohio	Cucumbers and Cantaloupes

The test fungicides are listed below. Several cooperators also reported on other materials:

Material	Spray	Dust
Tribasic	3(4)-100	10% Tribasic
Zerlate	2-100	8% Zerlate
Parzate	2-100	8% Parzate
Dithane Z-78	2-100	8% Dithane Z-78

Cucumbers for Pickles

Reports were received from Ohio and Delaware. The data are presented in Table 1.

Disease Control: Disease was not a factor in Ohio. In Delaware, the downy mildew disease was a factor, even though it appeared late; some anthracnose also was present in Delaware. The data from Delaware show that all materials were about equal for control of downy mildew; as regards anthracnose, the organics gave control but the coppers did not. (The amount of anthracnose present was not enough to cause defoliation).

Yield: In Delaware, Dithane Z-78 and Zerlate gave the highest yields. There were no significant differences in Ohio.

Injury: Copper A caused severe leaf injury and Parzate dwarfed the plants in Delaware. (Most of the Copper A injury followed after one of the early applications). Parzate was reported injurious in Ohio.

Table 1. National Cooperative Cucurbit Fungicide Test on Cucumbers for Pickles. 1948.

Material	Concentration	Ohio [a] (Wooster) Yield (lbs/Acre)	Delaware [b] % Defoliation	Delaware [b] Yield (lbs/Acre)	Remarks
No Fungicide		13,920	75	5,566	
Tribasic	10% dust	13,680			
ditto	3-100		30	7,637	
Copper A	10% dust	13,280			
ditto	3 1/3-100		40	4,931	Injury
Fermate	8% dust	12,960			
ditto	2-100		35	7,907	
Zerlate	8% dust	14,080			
ditto	2-100		38	8,640	
Parzate	6% dust	13,600			Injury
ditto	2-100		35	5,390	Dwarfing
Dithane Z-78	6% dust	15,200			
ditto	2-100		23	8,560	
Cu-Zn-Chromate	8% dust	16,640			
L.S.D. at 5% Level		NS		1,319	

[a] Disease not a factor in Ohio.

[b] Downy Mildew disease a factor in Delaware, although it appeared late.

Note: Applications - Ohio, not given; Delaware, eight (July 2-Aug. 18).

Table 2. National Cooperative Cucurbit Fungicide Test on Cucumbers for Slicing. 1948

Material[a]	Con-centration	Michigan[b] Yield (Lbs/Plot)	Ohio[c] Anthracnose (%)	Ohio[c] Yield (Lbs/Plant)	Louisiana[d] Downy Mildew (%)	Louisiana[d] Anthracnose (%)	Louisiana[d] Yield (Bu/A)	South Carolina[e] SC-5[f] Yield (Bu/A)	South Carolina[e] Marketer[g] Downy Mildew (%)	South Carolina[e] Marketer[g] Yield (Bu/A)	South Carolina[e] SC-5 and Palmetto[g] Average Yield (Bu/A)
No fungicide		63.9	6.1	4.83				165			
Tribasic	10% Dust		7.0	5.17	6.2	1.3	231	149	84	54	161
ditto	3-100	53.3							78	56	163
Zerlate	8% Dust		5.6	5.40	9.4	1.4	219	186	83	48	152
ditto	2-100	54.7							73	72	164
Parzate	8% Dust		4.5	5.66	8.1	0.2	195	176	93	24	155
ditto	2-100	50.4							88	39	154
Dithane Z-78	8% Dust		5.00	4.7	6.7	0.03	241	174	68	54	168
ditto	2-100	65.3							62	92	179
Fermate	8% Dust		7.8	4.80	8.8	0.06	168				
L.S.D. at 5% Level		NS		NS	NS		34	27		22	

[a] Applications: -- Michigan (4), July 20 - Aug.16; Louisiana, (15), Aug. 31 - Oct. 19; South Carolina (10), Aug. 28 - Oct. 19.

[b] No disease.

[c] Anthracnose appeared late. Not a factor in yield.

[d] Anthracnose appeared early early but then disappeared.

[e] Downy Mildew not severe on SC-5 and Palmetto varieties (mildew resistant) but very severe on Marketer variety. Disease reading on Marketer made on Oct.20. (Author's Note: Foliage went down rapidly after Oct.5. A reading should have been made about Oct. 10-12 to get best indication of differences).

[f] Test No. 1.

[g] Test No. 2. Marketer, SC-5, and Palmetto varieties planted side by side in this test. The yield of the SC-5 and Palmetto varieties is the average yield for both varieties.

Table 3. National Cooperative Cucurbit Fungicide Test on Cantaloupes. 1943.

Treatment[a]	Concentration	Ohio[b] Defol. (%)	Ohio[b] Yield No/A	Mich.[c] Yield	N. C.[d] Defol. (%)	N. C.[d] Yield (No/A)	Md.[e] Defol. (%)	Md.[e] Yield (No/A)	Md.[e] Soluble Solids (%)	Del.[f] Defol. (%)	Del.[f] Yield (No/A)
No Fungicide				34	80	3965	69	5127	8.7	50	5110
Bordeaux	6-3-100[g]						28	2677	7.7	8	4365
Tribasic	10% Dust	33	7830		46	3311				15	5075
ditto	3-100			35			46	4810	9.1	3	4615
Cooper A	10% Dust	25	7630							10	4990
ditto	3 1/3-100									8	4465
Fermate	8% Dust	30	7970								
ditto	2-100									3	5090
Zerlate	8% Dust	23	9100		42	3003				10	4950
ditto	2-100			39			46	5218	9.4	18	4850
Parzate	8% Dust	40	7000		42	2887				13	4850
ditto	2-100			35			46	4220	8.5	10	5025
Dithane Z-78	8% Dust	27	8370		37	3080				10	4740
ditto	2-100			27			31	5445	9.1	5	5050
L.S.D. at 5% Level			NS	NS	10.3	NS		625			619

[a] Applications: -- Mich. (7), July 20-Sept.13; N. C. (8), June 17-Aug.11;
Md. (6), July 1-Aug, 18; Del. (8), July 2-Aug. 18.

[b] Defoliation mainly due to phytotoxicity and some Macrosporium.

[c] Mich. yield is No. of Cantaloupes per plot (Hales Best). No disease of any consequence.

[d] N. C. yield is No. of Cantaloupes per acre. (Hales Best No. 36). Defoliation mainly by Downy Mildew. Disease appeared too late to affect yield; last dust application made after harvest season was over to obtain control data.

[e] Md. yield is No. of Cantaloupes per acre (Hales Best "Jumbo"). Defoliation due to Macrosporium.

[f] Del. yield is No. of Cantaloupes per acre. (Hales Best "Jumbo") Defoliation due to Macrosporium.

[g] Bordeaux used at 8-8-100 in Md.

Table 4. National Cooperative Cucurbit Fungicide Test on Watermelons. North Carolina - 1948. (Blacklee Variety)

Material	Concentration	Downy Mildew & Anthracnose[a] % Defoliation	No. Fruit Per Acre Marketable	Total
No Fungicide		93	1,347	1,906
Tribasic	5% Cu Dust	59	828	1,309
Tribasic + Sulfur	5-85 Dust	44	1,174	1,771
Zerlate	8% Dust	29	1,309	1,906
Parzate	8% Dust	37	1,097	1,809
L.S.D. at 5% Level		7.4	344	468

[a] Anthracnose appeared early but developed slowly. Downy Mildew appeared very late. Neither disease appeared to affect yields. Disease reading taken after harvest had been completed.

Note: Ten dust applications, June 8-Aug. 11.

Cucumbers for Slicing

Reports were received from Ohio, Louisiana, Michigan, and South Carolina. The data are presented in Table 2.

Disease Control: There was no disease in Michigan. Ohio had a light dose of anthracnose which did not affect yield. In Louisiana, downy mildew was severe in untreated fields and some was present in the test plots; some anthracnose was also present. In South Carolina there was no disease on the SC-5 variety (downy mildew resistant) but downy mildew was severe on the Marketer variety.

Data on control show, in general, that the organics were better than the coppers for anthracnose control and as good as the coppers for downy mildew control. Sprays gave better control than dusts.

Yield: There was little difference in yields in Michigan and Ohio. In Louisiana, Dithane Z-78 and Tribasic gave the highest yields. In South Carolina, on the SC-5 variety, Zerlate, Parzate, and Dithane Z-78 gave higher yields than Tribasic; on the Marketer variety, Dithane Z-78 gave the highest yield, followed by Zerlate. Sprays gave higher yields than dusts.

Injury: Parzate stunted the plants in Ohio. In Louisiana, plots dusted with Parzate and Zerlate lacked vigor and showed evidence of injury, whereas plots dusted with Tribasic and Dithane Z-78 were vigorous. In South Carolina, Dithane Z-78 and Zerlate were the safest materials and Parzate the most injurious. No injury of consequence was noted in Michigan.

Cantaloupes

Reports were received from Ohio, Michigan, North Carolina, Maryland, and Delaware. The data are presented in Table 3.

Disease Control: There was no disease of any consequence in Michigan. In Ohio, some Macrosporium leaf spot appeared late; all materials gave about equal control. In North Carolina, downy mildew appeared too late to affect yields and dusting had to be continued beyond the harvest period to obtain control data-- all the materials gave about equal control. In Maryland, Macrosporium became fairly serious and Bordeaux and Dithane Z-78 gave the best control. In Delaware, Macrosporium was also a factor but it was not as serious as in Maryland-- all the materials gave about the same control.

Yield: In Ohio, Michigan, and North Carolina there was no significant difference. However, it is of interest to note that Parzate gave low yield in Ohio and North Carolina, whereas Dithane Z-78 gave low yield

in Michigan. In Maryland, Bordeaux and Parzate significantly reduced the yield; Dithane Z-78 gave the highest yield, but the increase was not significant over the untreated. Data from Maryland on percent Soluble Solids shows that Bordeaux caused a reduction. In Delaware, Bordeaux significantly reduced the yield; no material increased yield.

Injury: There was no injury in Michigan except some marginal chlorosis from Tribasic. In Ohio, Parzate was toxic. No injury was mentioned in North Carolina. In Maryland, Bordeaux and Parzate was injurious. Bordeaux was also injurious in Delaware.

Watermelons

A report was received from North Carolina. The data are presented in Table 4.

Disease Control: Anthracnose appeared early but developed slowly. Downy mildew appeared very late. Neither disease appeared to appreciably affect yields. Dusting was continued beyond the harvest season to obtain control data. Zerlate and Tribasic + Sulfur gave the best control--Tribasic alone gave the poorest control.

Yield: Tribasic significantly reduced the yield. No treatment increased the yield.

Injury: Cooperator's note: "The earliness and frequency of dust applications may partially explain why Tribasic apparently caused a reduction in yield".

GENERAL SUMMARY

The 1948 season, on the whole, was a year of light disease attack on cucurbits. Downy mildew disease was of little consequence except on cucumbers in South Carolina, Louisiana, and Delaware. Anthracnose disease was present in small amounts in Ohio, Louisiana, North Carolina, and Delaware. Macrosporium leaf spot disease was serious in Maryland, and to a less extent in Delaware, on cantaloupes.

Although the data are not significant, the zinc dithiocarbamate fungicides gave better control of anthracnose disease than did the copper fungicides.

As regards downy mildew disease, the 1948 data are in line with those obtained in 1947 showing that the zinc dithiocarbamate fungicides are effective in control.

More data are required on the control of Macrosporium leaf spot disease.

Dithane Z-78 and Parzate, containing the same toxicant (zinc ethylene bisdithiocarbamate), reacted differently. Dithane Z-78 was non-injurious whereas Parzate was injurious. Also, Dithane Z-78 gave better disease control than Parzate.

Zerlate gave consistent results. Tribasic gave good results, except where applied too frequently.

Dithane Z-78 was the best material in the 1948 test, on the basis of disease control, lack of injury, and yield.

The most significant point in the 1948 data is that the zinc dithiocarbamate fungicides did not increase yield in the absence of disease.

SUMMARY OF DATA ON COOPERATIVE GLADIOLUS CORM TREATMENT EXPERIMENT FOR 1948

J. L. Forsberg

Cooperators by States:

Colorado - A. O. Simonds, Colorado A & M College, Fort Collins
Florida - R. O. Magie and H. N. Miller, Vegetable Crops Laboratory, Bradenton
Illinois - J. L. Forsberg, Natural History Survey, Urbana
Maryland - W. D. McClellan, U.S.D.A., Beltsville
Michigan - Ray Nelson, Michigan State College, East Lansing
New York - D. M. Yoder, Cornell University, Ithaca
Ohio - H. A. Runnels, Agricultural Experiment Station, Wooster
South Dakota - S. H. Edmunds, Twin Rivers Plantation, Sioux Falls

Planting stock and plot layouts: Corms and cormels of the Picardy variety furnished by members of the Kankakee County (Illinois) Gladiolus Growers Association were used by all cooperators. These corms were selected from stock in which scab, Fusarium rot, and Sclerotinia dry rot were present. All plots were laid out as randomized blocks, 6 replicates per treatment, 25 corms and 50 cormels per replicate.

Treating materials and methods: Materials were supplied by the manufacturers and distributed to all cooperators from one batch of each material. Treatments were made immediately before planting as follows:

1. New Improved Ceresan, 1 ounce plus 2 tablespoons Dreft to 3 gallons of water. Corms soaked 15 minutes; cormels 30 minutes.

2. Ceresan M, 1 ounce to 3 gallons water, no additional spreader. Corms soaked 15 minutes; cormels 30 minutes.

3. Lysol, 60 ml. to 3 gallons water, no additional spreader. Corms and cormels soaked 3 hours.

4. Arasan, applied as a dust full strength.

5. Dow 9B Wettable Seed Protectant, 4 ounces to 3 gallons water, no additional spreader. Corms soaked 15 minutes; cormels 30 minutes.

6. Dowicide B, 6 ounces to 3 gallons water, no additional spreader. Corms soaked 15 minutes; cormels 30 minutes.

7. Puratized Agricultural Spray, 45.4 ml. to 3 gallons water (1:5000 active), no additional spreader. Corms soaked 15 minutes; cormels 30 minutes.

8. Parzate, 6 ounces to 3 gallons water, no additional spreader. Corms soaked 15 minutes; cormels 30 minutes.

9. Corrosive sublimate, 11.4 grams to 3 gallons, no additional spreader. Corms and cormels soaked 2 hours.

10. Check, untreated.

Results: Records were taken on stand, flower production, total corms dug, rot-free corms, corms with Fusarium rot, scabby corms, weight of corms produced, and weight of cormels produced. Records on date of blooming were also taken by four of the cooperators.

Fusarium rot and bacterial scab were the only diseases of any consequence which developed in any of the plots. A few corms with Sclerotinia dry rot were noted in New York and South Dakota, and some Curvularia lesions were observed in Florida. These diseases were in such small amounts they can be disregarded in the results.

The effects of the various treatments were very pronounced in the corm plots. Differences in effectiveness of treatments were not apparent in the cormel plots. The effectiveness of the treatments in controlling Fusarium rot are shown best by flower production and yields of rot-free corms. These data are summarized in tables 1 and 2.

For control of Fusarium rot the four outstanding materials used in these experiments were Dowicide B, Dow 9B, New Improved Ceresan and Lysol. All four of these materials were effective in seven States. In South Dakota, use of New Improved Ceresan did not result in yields of flowers on rot-free corms significantly greater than those from untreated corms. Arasan, Ceresan M, Parzate and corrosive sublimate were effective in some States but not in others. Puratized Agricultural Spray was generally ineffective.

Percentages of scabby corms are shown in table 3. The amount of scab varied greatly in the different States. Corrosive sublimate reduced the amount of scab to zero in two States and appeared to be the most effective material in five others. None of the other materials were generally effective against scab.

No injury was reported as resulting from any of the treatments used in these tests.

Table 1. Average number of flowers produced per replicate.

Treatment	Colo.	Fla.	Ill.	Md.	Mich.	N.Y.	Ohio	S.D.
N. I. Ceresan	18.3	16.2	21.7	20.1	21.0	19.8	18.8	15.5
Ceresan M	18.2	16.2	17.7	20.0	19.3	20.8	20.3	13.8
Lysol	20.0	13.0	19.8	20.5	18.2	16.3	17.8	16.8
Arasan	21.5	16.5	20.0	19.6	19.5	18.7	17.8	14.3
Dow 9B	20.0	17.0	21.3	19.3	21.2	19.8	19.8	16.6
Dowicide B	19.8	15.3	22.2	18.6	20.8	18.3	16.0	17.0
Puratized Ag. Spray	14.2	15.7	16.8	18.5	18.0	16.3	17.1	15.0
Parzate	15.8	16.3	14.0	16.6	21.2	19.0	18.3	14.0
Corrosive sublimate	20.3	10.5	17.7	20.5	16.7	19.0	15.8	13.8
Untreated	10.2	9.3	10.8	18.0	16.7	14.5	16.1	12.5
LSD at 5% level	3.2	6.5	3.4	N.S.	3.2	5.2	2.9	3.7
LSD at 1% level	4.3	8.7	4.5		4.3	7.0	3.9	5.0

Table 2. Average number of rot-free corms produced per replicate.

Treatment	Colo.	Fla.	Ill.	Md.	Mich.	N.Y.	Ohio	S.D.
N. I. Ceresan	14.5	14.3	19.7	20.7	19.8	22.2	22.1	18.0
Ceresan M	13.0	10.5	15.3	18.7	15.3	21.2	20.5	17.0
Lysol	17.5	12.3	18.7	19.3	19.2	21.8	22.0	19.8
Arasan	16.5	8.8	14.8	19.7	17.2	21.0	19.6	17.3
Dow 9B	14.5	15.5	17.3	18.0	21.0	19.3	23.8	18.3
Dowicide B	15.2	12.8	20.0	18.8	21.2	19.8	24.0	20.8
Puratized A. S.	4.3	10.5	13.0	9.3	7.0	14.0	10.0	16.3
Parzate	6.5	11.8	9.8	14.5	16.3	17.7	19.5	16.8
Corrosive sublimate	12.5	10.3	17.3	13.5	9.7	18.5	12.0	19.5
Untreated	3.7	6.2	7.0	13.3	7.5	10.7	11.5	16.0
LSD at 5% level	3.2	5.2	4.8	3.7	3.9	3.7	3.5	3.3
LSD at 1% level	4.2	7.0	6.5	4.9	5.2	4.9	4.7	4.4

Table 3. Percent of corms produced scabby.

Treatment	Colo.	Fla.	Ill.	Md.	Mich.	N.Y.	Ohio	S.D.
N. I. Ceresan	25.0	6.0	7.2	25.9	47.4	87.9	25.9	27.6
Ceresan M	18.2	15.0	18.3	33.1	58.5	77.4	47.6	32.5
Lysol	33.1	8.0	15.4	56.9	69.2	71.3	50.3	55.0
Arasan	30.2	44.0	13.8	58.9	48.1	69.2	74.5	51.6
Dow 9B	36.2	9.0	21.2	50.0	56.1	66.4	33.1	54.5
Dowicide B	23.3	6.5	1.4	29.7	71.0	78.8	25.8	39.7
Puratized A.S.	10.2	6.8	21.1	21.2	17.9	63.6	7.4	49.6
Parzate	18.5	9.1	23.9	36.5	34.7	69.3	35.3	50.0
Corrosive sublimate	14.9	0.0	0.0	11.0	9.1	62.2	1.6	41.5
Untreated	14.7	5.3	19.0	44.0	28.2	73.4	35.1	32.8

COOPERATIVE TESTS OF FUNGICIDES FOR SNAPDRAGON RUST CONTROL - 1948

A. W. Dimock

During the 1948 season tests were set up at Los Angeles, Calif. (K.F. Baker), Beltsville, Md. (W.D. McClellan), Farmingdale, N.Y. (C.H. Ford), and Ithaca, N. Y. (A.W. Dimock). Parzate (2 lbs./100 gals.) and Dithane D14 plus zinc sulfate (2qts./1 lb./100 gals.) were compared at a 1 week interval and Parzate, Dithane D14 plus zinc sulfate, Dithane Z-78 (2 lbs./100 gals.), manganese ethylene bis dithiocarbamate (1.3 lbs./100 gals.), and IN10425 plus zinc sulfate (2qts./100 gals.) at a 2-week interval. Tests the previous season had indicated that a 1-week interval would be too short for a critical comparison of highly effective materials, but the 2-week interval proved too long during the 1948 season.

Results: Both Parzate and D14 gave near-perfect control at the 1-week interval at Los Angeles, Farmingdale and Ithaca. None of the materials gave satisfactory control at the 2-week interval at Los Angeles and Ithaca, while only moderate control was obtained at Farmingdale where the disease potential was lower. Rust failed to develop at Beltsville, presumably because of excessively high summer temperatures. None of the materials gave any evident injury of snapdragons nor was there any objectionable residue in the Farmingdale and Ithaca plots, where summer rains were fairly frequent. Additional observations on the Los Angeles plots, supplied by Dr. Baker, follow:

"1. Applications in this region must be made every 7 days. A 14-day interval gives essentially no commercial control, regardless of material. It is speculative whether this is due to (1) breakdown of spray residue between 7 and 14 days or (2) growth of new leaves which become infected before being covered by spray, but the second seems more probable.
"2. Parzate, 2 lbs./100 gals., applied every 7 days again gave perfectly satisfactory results. For seedsmen this still appears to be the best material, because of its slightly superior performance and the unimportance of the residue problem there. For cut flower growers the Dithane D-14, 2 qts. plus 1 lb. zinc sulfate/100 gals., applied every 7 days would be the better material because of commercially satisfactory performance and absence of conspicuous residue. Both gave an average of 0-1 performance on the scale indicated.
"3. All 14-day applications were approximately equal in ineffectiveness. While they all were decidedly better than the checks (which rated 3 on the scale) they certainly were not commercially satisfactory and also would be rated 3 on the scale. Because of the excessive time interval it is hard to evaluate them. Parzate and Dithane D-14 definitely are established as satisfactory with correct timing;
"3. Dithane Z-78 and IN10425 may well be effective on correct timing.

Manganese ethylene bis, both in 1946 and 1948, was unsatisfactory; it has nothing to offer in advantage over Parzate or Dithane D-14.
"4. There was no positive evidence of any phytotoxicity from the materials. Possibly Dithane Z-78 gave some stunting, but this is not certain."

SUMMARY OF DATA FROM NATIONAL COOPERATIVE POTATO SPRAY FUNGICIDE EXPERIMENT

W. F. Buchholtz

Contributors of data, by States:

Maine	Reiner Bonde
Connecticut	Saul Rich
New York	Robert C. Cetas
Penneylvania	Webster A. Chandler
New Jersey	John C. Campbell
Delaware	J. W. Heuberger
Tennessee	E. L. Felix
Ohio	J. D. Wilson
Indiana	R. W. Samson
Michigan	J. H. Muncie
Wisconsin	H. M. Darling
Iowa	W. J. Hooker
Minnesota	Carl J. Eide
North Dakota	Wm. G. Hoyman
Nebraska	A. F. Sherf

PLAN OF THE EXPERIMENT

Spray Treatments

1.	Check, no fungicide	
2.	Bordeaux	8-4-100
3.	Tribasic copper sulphate	4-100
4.	Copper oxychloride sulphate	4-100
5.	Copper zinc chromate	2-100
6.	Dithane D14 or Z78	2-100
7.	Parzate	2-100
8.	Zerlate	1 1/2-100

DDT, 50%, 1 1/2 lb.-100, included in all fungicide sprays and applied alone to all no fungicide check plots.

SPRAY MATERIALS were acquired by the individual experimenters, in most instances directly from the manufacturer.

SPRAY EQUIPMENT was that available to individual experimenters. PRESSURES and DOSAGES were those effected by the equipment available.

PLOT SIZE varied; 50 ft. of row was suggested. Four to six REPLICATIONS were most commonly used.

Table 1. Location, diseases present, number and dates of sprays, variety, and planting and harvest dates for the 18 experiments in 15 States.

	State, Location	Diseases Present		Sprays		Variety	Planting Date	Harvest Date
		Late Blight	Early Blight	No.	Dates			
1.	Maine, Presque Isle	Moderate	Moderate	7	7/13-9/4	Katahdin	5/15	10/5
2.	Connecticut Mt. Carmel	---	---	5	8/11-9/8	Katahdin	6/30	10/14
3.	New York, Sagaponack, L. I.	Abundant	Abundant	11	6/8-8/18	Green Mountain	4/15	9/22
4.	Pennsylvania, State College	Moderate	Moderate	10	6/28-9/2	Katahdin	6/1	10/14
5.	State College	Moderate	Moderate	10	6/28-9/2	Russet Rural	6/1	10/14
6.	New Jersey, Cranbury	Moderate	Present	6	6/12-7/9	Katahdin	4/15	9/13
7.	Delaware, Selbyville	---	Heavy	5	8/6-9/17	Pontiac	6/23	10/14
8.	Tennessee, Crossville	---	Moderate	8	6/1-7/10	Katahdin	4/30	7/30
9.	Ohio, Wooster	---	Moderate	7	7/12-9/12	Katahdin	6/3	10/20
10.	Wooster	Moderate	Heavy	6	6/11-7/28	Cobbler	4/12	8/27
11.	Marietta	Moderate	Heavy	6	5/20-7/9	Cobbler	3/29	8/9
12.	Indiana, Lafayette	---	Present	4	7/3-8/10	Four*	4/30	9/20

Table 1. Location, diseases present, number and dates of sprays, variety, and planting and harvest dates for the 18 experiments in 15 States. (Continued)

State, Location	Diseases Present		Sprays		Variety	Planting Date	Harvest Date
	Late Blight	Early Blight	No.	Dates			
13. Michigan, Lake City	---	Abundant	7	6/29-8/30	Katahdin	5/17	9/13
14. Wisconsin, Starks	---	Heavy	8	7/7-9/1	Chippewa	5/20	9/30
15. Iowa, Crystal Lake	Moderate	Moderate	7	6/25-8/24	Cobbler	5/17	9/8
16. Minnesota, Crookston	Moderate	Abundant	6	7/18-8/28	Bliss Triumph	5/25	9/14
17. North Dakota, Northwood	Trace	Trace	6	7/12-9/3	Cobbler	6/10	10/12
18. Nebraska, Scottsbluff	---	Trace	2	8/11,8/31	Bliss Triumph	6/21	10/7

*Bliss Triumph, Chippewa, Katahdin, Sebago.

Table 2. Yields in potato spray plots in 18 similar experiments in 15 States.

	Check	Bordeaux	Tribasic	COCS.	Cu Zn Chr.	Di-Thane	Parzate	Zerlate	M.S.D.
1. Maine	407	467	483	487	479	432	476	489	39
2. Connecticut	297	348	262	333	254	404	369	320	61
3. New York	339	395	421	388	425	372	396	457	N.S.
4. Pennsylvania State College	355	386	416	380	386	409	429	388	36
5. State College	331	372	393	---	395	416	415	---	48
6. New Jersey	356	389	367	375	358	396	385	366	22
7. Delaware	188	212	217	---	---	272	244	235	45
8. Tennessee	134	143	126	137	---	135	131	---	N.S.
9. Ohio Wooster	294	---	314	328	342	358*	367	349	22
10. Wooster	408	534	528	490	586	602*	621	566	58
11. Marietta	398	562	558	538	547	588*	608	570	46
12. Indiana	168	165	172	159	176	174	171	177	N.S.
13. Michigan	305	277	283	279	281	343	342	353	50
14. Wisconsin	356	377	400	397	428	449	441	404	26
15. Iowa	311	377	425	---	405	428	428	402	38
16. Minnesota	178	180	186	180	178	208	203	197	N.S.
17. North Dakota	276**	---	281	---	304	314	315**	296**	17
18. Nebraska	528	476	516	---	546	510	477	473	48

* Z 78

**DDT on check and Parzate and Zerlate applied as dusts in North Dakota.

Table 3. Percentages of defoliation in potato spray plots in 18 similar experiments in 15 States.

		Check	Bordeaux	Tribasic	COCS.	Cu Zn Chr.	Dithane	Parzate	Zerlate	Date
1.	Maine	67	38	38	44	42	37	53	47	9/15
2.	Connecticut	no disease								
3.	New York	93	26	46	40	37	30	23	76	8/27
4.	Pennsylvania									
	State College	100	25	22	28	26	18	19	38	9/14
5.	State College	100	11	28	--	15	15	17	--	9/14
6.	New Jersey	31	2	2	2	2	4	2	17	
7.	Delaware	83	30	38	--	--	30	33	43	9/10
8.	Tennessee	33	33	37	17	--	36	33	--	6/29
9.	Ohio									
	Wooster	75	--	40	47	25	25*	27	25	9/18
10.	Wooster	96	55	52	65	37	40*	36	37	8/13
11.	Marietta	80	39	39	48	46	45*	36	44	7/17
12.	Indiana	no differences noted								
13.	Michigan	83	67	65	83	42	50	60	58	9/12
14.	Wisconsin	95	82	78	74	64	53	59	85	8/28
15.	Iowa	81	49	49	--	43	43	43	56	8/12
16.	Minnesota	82	9	18	20	15	16	14	56	9/2
17.	North Dakota	very little early blight								
18.	Nebraska	only trace early blight								

* Z 78

Table 4. Rank of treatments, by yield:

	Check	Bordeaux	Tribasic	COCS.	Cu Zn chr.	Dithane	Parzate	Zerlate
In 8 experiments with both early and late blight.								
3. New York	8	5	3	6	2	7	4	1
4. Pennsylvania State College	8	5	2	7	5	3	1	4
5. State College	6	5	4	-	3	1	2	-
6. New Jersey	8	2	5	4	7	1	3	6
10. Ohio Wooster	8	5	6	7	3	2	1	4
11. Marietta	8	4	5	7	6	2	1	3
15. Iowa	7	6	3	-	4	1	1	5
16. Minnesota	7	5	4	5	7	1	2	3
Average	7.5	4.6	4.0 (4.8)*	6.0	4.6	2.3	1.9 (2.6)**	3.7
In 5 experiments with early blight but little or no late blight.								
1. Maine	8	7	3	2	5	4	6	1
7. Delaware	6	5	4	-	-	1	2	3
9. Ohio, Wooster	7	-	6	5	4	2	1	3
13. Michigan	4	8	5	7	6	2	3	1
14. Wisconsin	8	7	5	6	3	1	2	4
Average	6.6	6.7	4.6 (5.4)*	5.0	4.5	2.0	2.8 (2.4)**	2.4

Table 4. (Continued)

	Check	Bordeaux	Tribasic	COCS.	Cu Zn chr.	Dithane	Parzate	Zerlate
In 5 experiments with little or no early blight and no late blight.								
2. Connecticut	6	3	7	4	8	1	2	5
8. Tennessee	4	1	6	2	-	3	5	-
12. Indiana	6	7	4	8	2	3	5	1
17. North Dakota	6	-	5	-	3	2	1	4
18. Nebraska	2	6	3	-	1	4	5	7
Average	4.8	4.2	5.0	4.7	3.5	2.6	3.6	4.2
Average, all experiments	6.5	5.1	4.4	5.4	4.3	2.3	2.6	3.4
	8	6	5	7	4	1	2	3

* Average of 3 coppers
** Average of 3 zinc organics
(All rankings below check underlined)

Table 5. Rank of treatments, by percentage of defoliation:

	Check	Bordeaux	Tribasic	COCS.	Cu Zn chr.	Dithane	Parzate	Zerlate
In 8 experiments with both early and late blight.								
3. New York	8	2	6	5	4	3	1	7
4. Pennsylvania State College	8	4	3	6	5	1	2	7
5. State College	6	1	5	-	2	2	4	-
6. New Jersey	8	1	1	1	1	6	1	7
10. Ohio Wooster	8	6	5	7	2	4	1	2
11. Marietta	8	2	2	7	6	5	1	4
15. Iowa	7	4	4	-	1	1	1	6
16. Minnesota	8	1	5	6	3	4	2	7
Average	7.6	2.6	3.9 (3.8)*	5.3	3.0	3.1	1.6 (3.4)**	5.7
In 5 experiments with early blight but little or no late blight.								
1. Maine	8	2	2	5	4	1	7	6
7. Delaware	6	1	4	-	-	1	3	5
9. Ohio, Wooster	7	-	5	6	1	1	4	1
13. Michigan	7	6	5	7	1	2	4	3
14. Wisconsin	8	6	5	4	3	1	2	7
Average	7.2	3.7	4.2 (4.5)*	5.5	2.2	1.2	4.0 (3.2)**	4.4

Table 5. (Continued)

	Check	Bordeaux	Tribasic	COCS.	Cu Zn chr.	Dithane	Parzate	Zerlate
	In 5 experiments with little or no early blight and no late blight.							
2. Connecticut	no disease							
8. Tennessee	2	2	6	1	-	5	2	-
12. Indiana	no differences noted							
17. North Dakota	very little blight							
18. Nebraska	only trace early blight							
Average	none computed							
Average, all experiments	7.1 8	2.9 4	4.1 5	5.0 6	2.7 3	2.6 2	2.5 1	5.1 7

*Average of 3 coppers
**Average of 3 zinc organics
(All rankings below check underlined)

VARIETY and CULTURAL PRACTICES were those locally adapted and used.

DEFOLIATION PERCENTAGES were estimated after the method of Horsfall and Barratt. YIELDS were determined at harvest time.

Selection of spray materials and planning of the experiment were undertaken after all prospective cooperators had been consulted by correspondence.

The 1948 experiments were developed and executed with the same objectives and prerogatives in mind that were considered significant in 1947:

1. The effort is primarily one of coordinated evaluation of promising new organic fungicides.

2. A cooperative test such as this cannot make development by locally adapted spray programs one of its immediate objectives.

3. To facilitate reasonable comparisons this cooperative test must be small, simple and concise so that all cooperators will execute it in entirety.

In essence, the 1948 experiment is a duplicate of the 1947 experiment, with eight treatments rather than six as in 1947.

RESULTS

Table 1 contains information descriptive of the 18 individual experiments in 15 States. Each experiment is listed by number according to location and State, approximately according to geographic distribution. In all succeeding tables, these numbers are in the left column and are a means of reference to the experiments listed in table 1. Experiments 3, 4, 5, 6, 10, 11, 15 and 16 are those in which both early blight and late blight were present. In experiments 1, 7, 9, 13, and 14 there was early blight but little or no late blight. In experiments 2, 8, 12, 17 and 18 there was little or no early blight and no late blight. Tables 4 and 5 are arranged according to this grouping of the experiments. Tables 2 and 3 contain yield and defoliation data, respectively; in consecutive arrangement as in table 1.

In table 2 are yields in bushels per acre, for all treatments in each experiment, with minimum significant differences (M.S.D.) at the 5 percent level for each experiment unless mean differences were not significant (N.S.). In table 3 are percentages of defoliation for all treatments in each experiment. The dates of defoliation estimates are listed in the column to the right.

In table 4 are the yield ranks of treatments by experiments, in three groups as indicated above: 1) those with both early and late blight, 2) those with early blight only and 3) those with virtually none of either disease. Treatment rankings below that of the check are underlined. Included are average rankings of treatments by groups and for all experiments. The last row of treatment rankings is a composite based on average rankings for all experiments. In the groups of experiments with one or both diseases present, rankings of the three copper fungicides, Bordeaux, Tribasic and C-O-C-S, and of the 3 zinc-containing organics, Dithane, Parzate and Zerlate, have been pooled into averages (in parentheses and with asterisks) which are in the Tribasic and Parzate columns, respectively.

In table 5, ranks of treatments, by percentage of defoliation, are presented in an arrangement identical to that in table 4. For only one experiment in the group with little or no disease (8, Tennessee) were any defoliation estimates made.

When comparing the relative performance of the fungicide treatments in these experiments, it is appropriate to have in mind that in none of them was late blight development intensive for a sustained period during the growing season. Furthermore, in only two States (New York with 11, Pennsylvania with 10) were more than 8 sprays applied during the season. In 10 of the 18 experiments, of course, there was little or no late blight.

Under these conditions Dithane and Parzate were the over-all high-ranking treatments both by yield and by percentage of defoliation. By yield, the 3 zinc organics, Dithane (1), Parzate (2) and Zerlate (3) outranked the 3 coppers, Bordeaux (6), Tribasic (5) and C-O-C-S (7). Copper zinc chromate ranked fourth, alongside Tribasic.

Certain inter-group comparisons of average ranks seem pertinent. For instance, the 3 coppers tended to be ranked better by percentage of defoliation (3.8, 4.5) than by yield (4.8, 5.4); conversely, the 3 zinc organics tended to be ranked poorer by percentage of defoliation (3.4, 3.2) than by yield (2.6, 2.4). Copper zinc chromate seems, like the coppers, to be ranked higher by percentage of defoliation than by yield. These comparisons are between groups of experiments with one or both diseases present in which defoliation estimates were available.

Both by yield and by percentage of defoliation, the coppers tend to rank higher in experiments with both early and late blight (4.8, 3.8) than in experiments with early blight only (5.4, 4.5). A possible exception is C-O-C-S.

Similar comparisons of individual treatments seem non-fruitful, with the possible exception of those involving Bordeaux and Zerlate. Bordeaux ranked better by percentage of defoliation (2.6, 3.7) than by yield (4.6,

6.7); Zerlate ranked poorer by percentage of defoliation (5.7, 4.4) than by yield (3.7, 2.4). In experiments with late blight as well as early blight, Bordeaux ranked higher both by yield and by percentage of defoliation (4.6, 2.6) than in experiments with early blight only--no late blight (6.7, 3.7).

These comparisons between Bordeaux and Zerlate seem to fairly well summarize the evidence for 1948 for all materials. The zinc organics were in general superior to the coppers, more so in yield than in disease control, especially where early blight was the only disease in evidence. Where late blight was present the coppers, especially Bordeaux and Tribasic, performed credibly, especially in disease control (percentage of defoliation). In general these results confirm those recorded in 1947. They seem furthermore to be in accord with the oft-repeated suggestions that the coppers tend to be superior to the zinc organics for late blight control, not so for early blight control (perhaps the reverse); that the coppers, particularly Bordeaux, are toxic to potato foliage, and that the zinc organics are not so toxic, and may in certain instances be stimulatory.

SUMMARY OF 1948 COOPERATIVE TOMATO FUNGICIDE EXPERIMENTS

M. B. Linn[1]

The following States and cooperators (plot location in parentheses) submitted data for this report:

Delaware (Wyoming)--J. W. Heuberger
Illinois (Urbana)--M. B. Linn and R. G. Emge
Iowa (Ames, Test 1, and Conesville, Test 2) W. J. Hooker and N. R. Gerhold
Maine (Orono)--M. T. Hilborn
Maryland (Hurlock)--C. E. Cox
Michigan (E. Lansing)--M. C. Strong
Minnesota (University Farm)--C. J. Eide
New Jersey (N. Brunswick, Test 1)--B. H. Davis
New Jersey (Riverton, Test 2)--S. G. Younkin
New York (Geneva)-- W. T. Schroeder
North Carolina (Hendersonville)--D. E. Ellis
North Dakota (Fargo)--W. E. Brentzel
Ohio (Wooster, Test 1; Fremont, Test 2; and Apple Creek, Test 3)--J.D. Wilson
Pennsylvania (State College, Test 1, and Lebanon Co., Test 2)--W. S. Beach
South Carolina (Charleston)--W. M. Epps
South Dakota (Brookings)--C. M. Nagel
Tennessee (Knoxville, Test 1)--E. L. Felix
Tennessee (Jackson, Test 2)--J. M. Epps

Spray plots of R. W. Samson (Indiana) were lost to cucumber mosaic early in the season.

Most of the six fungicides or treatments chosen by the cooperators were used in all but a few tests. These materials are numbered 1 to 6 below. In some instances cooperators tried combinations or alternating applications of fungicides. Relatively new materials were subjected to critical field tests in several States. These materials and combinations at concentrations generally used, with abbreviations in parentheses adopted for tabulation, are:

Sprays

1. Bordeaux mixture 8-8-100
2. Dithane Z-78 (Z-78) 2-100
3. Parzate 2-100
4. Tribasic copper sulfate (Tribasic) 4-100
5. Zerlate 2 lb.-100 gal.
6. Zerlate alternating with Tribasic (Z-T-Z-T-Z) 2 and 4-100
7. CuZnChromate L. 658 (CuZnCh) 2 to 4-100
8. Yellow Cuprocide (Cu_2O) 1.5-100
9. Copper oxychloride sulfate (C-C-C-S) 4-100
10. Copper A 4-100
11. Bioquin 1 (Bioq.1) 1-100
12. Bioquin 50W (Bioq.50W) 1-100
13. Bioquin 1 + wettable sulfur (Bioq. + S.) 1/4-3-100
14. Tennessee Copper + Zinc (Tenn. Cu+Zn) 5 to 5.5-100

[1] Sincere thanks are extended to each cooperator and fungicide manufacturer who made these tests possible.

15. Gen. Chem. 308 (G. C. 308) 3-100
16. Gen. Chem. 629 (G. C. 629) 3-100
17. Phygon XL 1-100
18. Manganese ethylene bis-dithiocarbamate (Mn ethyl.) 2-100
19. Zerlate alternating with Bordeaux (Z-Z-B-Z-B and Z-B-Z-B-Z)
20. Zerlate alternating with Tribasic (Z-Z-Z-T-T and Z-Z-T-Z-T)
21. Zerlate alternating with D-14 (Z-Z-14-Z-14)
22. Zerlate alternating with Z-78(Z-Z-78-Z-78)
23. Zerlate + Tribasic-tank mix (Z+T) Ill. =1-2-100; Pa.= 2-2.7-100
24. Zerlate + Parzate-tank mix (Z+P) Ill. and Pa. =1-1-100; N.Y.=1.5-1.5-100.
25. Dithane D-14 + zinc sulfate (D-14) 2 qt.-1 lb.-100
26. IN-10425 + zinc sulfate (IN-10425) Ill. and Md. = 2 qt. -3/4 lb-100; Pa.=2 qt.-1 lb. -100
27. Goodrite Zac (Zac) 2-100
28. Methasan, wettable (Meth.) 3 lb.-100

Dusts

1. Copper oxychloride sulfate 15%
2. CuZnChromate 15%
3. Dithane Z-78-13%
4. Parzate 10-13%
5. Tribasic copper sulfate 6-7% Cu as metallic
6. Yellow Cuprocide 5%
7. Zerlate 10-13%
8. Zerlate alternating with Tribasic

It was suggested that each cooperator use as a minimum five replicates of 10 plants each and that five applications of fungicides be put on at 10-day intervals. The time of first application was left strictly to the discretion of the individual cooperator, although it was hoped that this would be not later than 30 days after the appearance of the first crown flowers. It was also suggested that any fruit with one or more anthracnose lesions be classified as a cull. The method of Horsfall and Barratt was to be used in estimating defoliation.

Rohm and Haas sticker and spreader Triton B-1956 was supplied to each cooperator to use if he saw fit.

Observations covering performance of fungicides, incidence of diseases, weather conditions, phytotoxicity, etc., were submitted by most cooperators during or at the end of the season. These have been condensed as much as possible in this summary. These notes should be extremely useful in evaluating the results of tests in individual States and are therefore worthy of careful reading.

The data from the spray experiments are summarized by States and treatments in Tables 1-5, and those from dust experiments in Table 6.

Table 1. Yields in Tons per Acre (Nos. 1 and 2) Spray Experiments on Tomatoes, 1948
(Six "first choice" treatments used in each test)

Treatment	Del.	Ill. (1)	Md.	Mich.	Ohio (3)	Pa. (1)	Minn.	N. J. (1)	Mean
Z-78	9.50	20.54	6.3	17.5	14.38	25.3	13.15	17.3	15.6
Parzate	9.47	19.47	3.8	15.5	15.80	22.5	15.15	13.4	15.0
Z-T-Z-T-Z	8.68	13.75	5.6	15.1	15.08	24.0	12.90	17.9	14.7
Tribasic	8.34	13.53	7.9	16.2	15.13	23.8	13.90	17.7	14.6
Bordeaux	8.93	16.05	6.1	16.2	13.00	24.0	11.01	16.5	14.0
Zerlate	9.56	17.49	4.9	13.5	14.50	18.6	13.74	17.5	13.7
None	4.93	7.43	2.8	13.6	11.53	11.5	14.14	18.5	10.5
CuZnCh				14.9	12.95	20.8			
Cu_2O				15.8					
Bioq. 1				16.8					
Bioq. 50W			5.1						
Tenn. Cu+Zn						23.1			
Phygon XL			3.9	17.5					
Z-Z-B-Z-B						22.6			
Z-B-Z-B-Z					13.43				
Z-Z-Z-T-T			4.7			23.1			
Z + T						23.7			
Z + P						19.9			
D-14		21.66	5.9	17.6					
IN-10425			3.9			20.7			
Zac				16.3		22.3			
Meth.					15.83				
L.S.D. (5%)	1.66	4.72	0.9	1.8	1.9	5.1	1.48	N.Sig.	

Late blight damaging in Pennsylvania (1); Septoria leaf spot predominant in Maryland, early blight prevalent in all tests except Minnesota and New Jersey (1) where but little of any disease was present.

Table 2. Yields in Tons per Acre (Nos. 1 and 2), Spray Experiments on Tomatoes, 1948
(Six "first-choice" treatments not used in each test)

Treatment	N.J. (2)	Ohio (2)	S.D.	Tenn. (1)	Iowa (1)	Iowa (2)	Me.	N.D.	Ohio (1)	Pa. (2)	Tenn. (2)	N.C.	N.Y.	Ill. (2)
Z-78		18.8	7.60				15.8	26.90	15.16	12.7	3.58			
Parzate	10.19	20.4		8.13	13.0	12.8	17.0		15.58	13.1	5.32	8.64		
Z-T-Z-T-Z	9.92	18.9	7.46					26.02						
Tribasic	10.08	18.6	6.39	8.24	15.5	14.1	14.9	24.56	14.65	14.2	4.64	11.65		
Bordeaux	7.98		7.23	6.56	15.0	14.4					4.87			
Zerlate	10.68	21.1	6.90	8.18	15.8	14.1	15.6	24.93	14.91	14.8	4.34		20.9	
None	6.84	16.0	5.02	8.09	14.9	13.2	13.4	24.66	14.58	8.7	4.37	3.24	20.5	7.8
CuZnCh	10.31	17.9	6.37	10.10			14.3		14.55		4.84		19.5[a]	
Cu_2O			7.03					25.60			4.40			
C-O-C-S	10.02			7.99					14.15					
Copper A				8.01										
Bioq. 1	12.04						17.0							13.5
Bioq. 50W														10.4
Bioq. + S.														19.3
Tenn. Cu+Zn	9.06									15.1				5.9
G. C. 308							14.4							
G. C. 629							13.3							
Phygon XL			6.94					25.53					21.3[a]	
Mn ethyl														21.3
Z-Z-B-Z-B										13.4			22.5	
Z-Z-T-Z-T	10.27												21.6	
Z-Z-Z-T-T	10.19									13.9				
Z-Z-14-Z-14													20.8	
Z-Z-78-Z-78													21.6	
Z + T										14.0				17.2
Z + P										12.7			23.6	20.1
D-14				8.73										

Table 2. (Continued)

Treatment	N.J. (2)	Ohio (2)	S.D.	Tenn. (1)	Iowa (1)	Iowa (2)	Me.	N.D.	Chio (1)	Pa. (2)	Tenn. (2)	N.C.	N.Y.	Ill. (2)
IN-10425														17.2
Zac	9.54						17.2							14.3
Meth.									16.24					
L.S.D. (5%)	1.81	--	1.33	2.28	N.S.	N.S.	2.1	N.S.	1.7	3.2	N.S.	3.62	N.S.	N.S.

[a]Orthol K added to all but these treatments.

Late blight damaging in Ohio (2), Pennsylvania (2), South Dakota and North Carolina; early blight prevalent in all tests except South Dakota, Maine, North Dakota, Tennessee (2) and North Carolina.

Table 3. Per cent Defoliation, Spray Experiments on Tomatoes, 1948

Treatment	Del.	Ill.[a] (1)	Md.	Mich.	Ohio (3)	Pa. (1)	Minn.	Mean	Iowa (1)	Iowa (2)	N.D.	Ohio (1)	N.C.	Tenn. (1)	N.Y.	Ill. (2)
Z-78	18	2	46	40	36	6	18	23.7			5	22		60		
Bordeaux	25	7	46	35	32	6	15	23.7	32	23						
Tribasic	33	12	39	36	28	6	18	24.6	32	23	2	30	20			
Parzate	23	3	74	41	32	6	17	28.0	37	74		25	30			
Z-T-Z-T-Z	33	6	65	40	38	11	19	30.3			3					
Zerlate	40	7	62	45	50	22	17	34.7	37	39	2	27		60	7	
None	70	67	85	51	76	45	21	59.3	43	84	8	65	58	60	78	95
CuZnCh				37	34	9			37	43		27		50	20[b]	
Cu2O				35							5			60		
C-O-C-S												32		60		
Copper A														70		
Bioq. 1		5		40												30
Bioq. 50W			60													60
Bioq. + S.																10
Tenn. Cu+Zn						9										55
Phygon XL			65	35							7				30[b]	
Mn ethyl.																5
Z-Z-B-Z-B						6									4	
Z-B-Z-B-Z					36											
Z-Z-T-Z-T															5	
Z-Z-Z-T-T						11										
Z-Z-14-Z-14															5	
Z-Z-78-Z-78															5	
Z + T						6										20
Z + P						10									3	15

Table 3. (Continued)

Treatment	Del.	Ill.[a] (1)	Md.	Mich.	Chio (3)	Pa. (1)	Minn.	Mean	Iowa (1)	Iowa (2)	N.D.	Chio (1)	N.C.	Tenn. (1)	N.Y.	Ill. (2)
D-14		2	50	40												
IN-10425			58			10										
Zac				43		20										50
Meth.					36											50
L.S.D. (5%)		3		5		3						22			6	

[a]Severe red spider mite infestation prevented accurate defoliation records after September 10.

[b]Orthol K added to all but these treatments.

Late blight damaging in Pennsylvania (1) and North Carolina, Septoria leaf spot predominant in Maryland, early blight prevalent in all others except Minnesota and North Dakota where but little of any disease was present.

Table 4. Per cent Anthracnose, Spray Experiments on Tomatoes, 1948

Treatment	Del.	Ill. (1)	Chio (3)	Pa. (1)	N.J. (1)	Mean	N.J. (2)	Chio (2)	Ohio (1)	Pa. (2)	N.Y.	Ill. (2)
Parzate	6.9	11.70	4.5	5.2	2.5	6.2	11.20	11.9	0.3	7.1		
Z-78	6.3	14.80	5.0	3.1	2.5	6.3		14.4	0.1	3.3		
Zerlate	6.4	17.55	3.4	3.6	1.8	6.5	4.95	10.0	0.1	2.4	6.8	
Z-T-Z-T-Z	9.3	15.93	3.7	4.1	1.7	6.9	7.10	12.4				
Bordeaux	9.6	33.71	6.2	8.5	1.4	11.8	11.52					
Tribasic	12.3	37.51	5.6	12.4	2.3	14.0	10.15	22.3	0.5	10.0		
None	27.3	63.04	14.1	28.5	3.0	27.2	31.97	29.3	1.6	12.7	12.8	47.5
CuZnCh			6.9	14.1			12.22	18.9	0.4		14.1[a]	
C-O-C-S							11.35		0.3			
Bioq. 1		24.67					12.20					35.5
Bioq. 50W												48.8
Bioq. + S.												13.0
Tenn.Cu+Zn				13.1			10.15			12.6		50.2
Phygon XL											6.7[a]	
Mn ethyl.												2.2
Z-Z-B-Z-B				3.1						5.2	3.6	
Z-B-Z-B-Z			3.5									
Z-Z-T-Z-T							5.67				5.1	
Z-Z-Z-T-T				8.2			4.42			4.1		
Z-Z-14-Z-14											6.1	
Z-Z-78-Z-78											5.5	
Z + T				4.4						3.7		19.7
Z + P				3.4						2.4	3.9	10.8

Table 4. (Continued)

Treatment	Del.	Ill. (1)	Ohio (3)	Pa. (1)	N.J. (1)	Mean	N.J. (2)	Ohio (2)	Ohio (1)	Pa. (2)	N.Y.	Ill. (2)
D-14		5.15		9.6								
IN-10425												17.8
Zac				4.6			10.12					33.7
Meth.			1.7						0.1			
L.S.D. (5%)	3.8	4.72	2.3	6.4	N.S.		5.09	2.4	-	2.3	2.2	14.2

[a]Orthol K added to all but these treatments.

Table 5. Per cent of Late Blight Fruit Rot, Spray Experiments on Tomatoes. 1918

Treatment	Pa. (1)	Pa. (2)	Ohio (2)	N.C.
Zerlate	12.3	9.0	2.3	
Tribasic	2.2	6.0	0	11.3
Parzate	11.0	10.2	0.2	21.8
Z-78	8.8	10.7	0.1	
Bordeaux	5.9			
Z-T-Z-T-Z	11.2		0.6	
None	15.0	11.1	4.5	65.4
CuZnCh	7.4		0.1	
Tenn. (Cu+Zn)	6.6	7.4		
Z-Z-B-Z-B	5.0	7.1		
Z-Z-Z-T-T	5.0	10.6		
Z + T	5.5	9.4		
Z + P	10.5	7.1		
Zac	10.5			
L.S.D.	--	--	--	8.5

Table 6. Yields in Tons per Acre (Nos. 1 and 2) and Per cent Fruit Rot and Defoliation, Dust Experiments on Tomatoes. 1948

Treatment[a]	Yield/Tons per acre			Per cent fruit rot			Per cent defoliation[bc]		
	Tenn. (2)	Tenn. (1)	S.C.	N.C.	Tenn. (1)	S.C.	N.C.	Tenn. (1)	N.C.
Zerlate	6.83	6.56	4.28		41.2	9.41		60	
Tribasic	7.90		5.98	11.61		0.60	9.1		22
Parzate	6.40		5.54	8.23		4.69	24.1		25
Z-78	7.80	6.78			50.4			60	
Z-T-Z-T-Z			5.25	7.42		2.85	40.6		30
None	6.90	6.51	2.36	3.24	32.0	29.44	65.4	60	58
CuZnCh	5.79	8.18			27.5			50	
Cu_2O	6.73	7.53			27.4			60	
C-O-C-S		7.69			19.7			60	
Copper A	6.51								
L.S.D.	--	2.3	1.72	3.62	--	--	8.5	--	8.7

[a] See spray treatments for Tennessee (1) (2) and North Carolina.

[b] Defoliation for S. C. plots worst in Zerlate; least in Tribasic; intermediate and about equal in Parzate and Z-T.

[c] Cladosporium leaf-mold infection index (North Carolina); Parzate=45, Tribasic=26; Z-T=32; None=65; L.S.D.=12.4.

Severe late blight infection in North Carolina and South Carolina.

No attempt has been made to develop efficiency ratings, such as was done for the 1947 report. Comparisons within tests are particularly valuable where the L. S. D. is given. The mean has been calculated for the data from experiments involving all six first choice treatments.

Practically all of the optional treatments are listed, even where they were tried by only one or two cooperators, because of their possible importance in future research on tomato fungicides.

Summary of Notes From Cooperators

Delaware (J. W. Heuberger). Most of the defoliation was caused by early blight, although Septoria was present until middle of August. Zerlate was somewhat poorer than in past years, possibly because of failure to control Septoria earlier. There was no evidence of phytotoxicity from any materials.

Illinois (M. B. Linn). Early blight was responsible for defoliation. Anthracnose was extremely severe, appearing at first harvest on August 4. Dithane D-14 was best, with Zerlate somewhat poorer than in 1947. Slight yellowing of leaflet margins was noted in Parzate and D-14 plots, but not in Z-78. Triton was used with all sprays. Red spider injury prevented defoliation records in Test 1 after September 10.

Iowa (W. J. Hooker). Defoliation was caused by Alternaria. Triton was used with all sprays except Bordeaux.

Maine (M. T. Hilborn). All plots were inoculated twice with Phytophthora infestans, with neither inoculation effective because of hot, dry weather. Only a slight amount of early blight was present, although a combination of this disease and flea beetles reduced yield from control plots. Only treatment showing spray injury was Gen. Chem. 629, severe leaf roll developing 26 days before first harvest.

Maryland (C. E. Cox). Defoliation was due mostly to Septoria and Alternaria, the former being the more damaging. Late blight was present by midseason, but was never a serious factor. Anthracnose occurred only in trace amounts. Zerlate and Triton were not appreciably better than Zerlate alone.

Michigan (M. C. Strong). Slight early blight infection was evident at third spray application, increasing gradually until end of season. No spray materials caused injury. Because of the dry season, there was less defoliation than in 1947. Percentage of culls was higher than in 1947, partly because of soft rots following pheasant damage.

Minnesota (C. J. Eide). Practically no diseases were present in plots, with defoliation seemingly due to nonpathogenic causes. A very few anthracnose-infected fruits were found during September. Some sprays tended to delay ripening, although Bordeaux was the only one resulting

in significantly less ripe fruit than control. Parzate plots produced the most ripe fruit and the highest total yield.

New Jersey (B. H. Davis, Test 1). Very little disease was present, and consequently little difference was noted between yields, culls, anthracnose and defoliation as a result of the various treatments.

New Jersey (S. G. Younkin, Test 2). A five-application schedule was not enough to prevent defoliation this year. By the time of fourth harvest, all plots were defoliated.

New York (W. T. Schroeder). Early blight was the only foliage disease, a light infection occurring quite late in the season. Differences in yield data were not significant, chiefly because viroses made it difficult to eliminate plants so affected or otherwise to provide for more uniformity within the plots. Several comparisons were made of fungicides with and without adjuvants.

North Carolina (D. E. Ellis). Plants were infected with Cladosporium when set in field. Late blight was first observed on July 15 or on the day the first fungicide was applied.

North Dakota (W. E. Brentzel). Very little disease developed in the plots. Some early blight was noted early in season, but it was confined almost entirely to lower leaves.

Ohio (J. D. Wilson). Late blight developed only in the plots at Fremont (Test 2). There was very little Septoria, but Alternaria caused considerable fruit infection at both stem and blossom ends. Some yellowing of leaflets was noted in Parzate, D-14 and Z-78 plots. Zerlate gave best control of anthracnose, but did not do so well in controlling defoliation.

Pennsylvania (W. S. Beach). First traces of late blight were noted at State College (Test 1) on August 20, eight days after the last spray. Progress of late blight was less rapid than in 1946-47. Late blight infections were not numerous on fruit. The situation in Lebanon County (Test 2) was quite similar. Tank mixture of Zerlate and Tribasic may make it possible to simplify recommendations. Zerlate used alone was rather poor for early and late blights. Z-78 was one of the best treatments for control of early blight and anthracnose. Fruit in Test 2 plots was damaged by hail late in July, resulting in an unusal amount of soft rot.

South Carolina (W. M. Epps). Early blight, leaf mold and gray leaf spot (Stemphylium) were present only in trace amounts. Late blight appeared as a trace in the middle of May. All plots were severely damaged, and many half-developed fruits rotted. Data for fruit rot do not present a true picture, because many small green fruits were lost before reaching

marketable size. Late-blight fruit damage was noted only at first harvest.

South Dakota (C. M. Nagel). Septoria leaf spot did not develop at all although conditions were thought to be ideal. Bacterial spot and speck did considerable damage to fruit throughout all plots. Late blight was severe especially on fruits toward the end of the season but was localized in the experimental area.

Tennessee (E. L. Felix, Test 1). Early blight first appeared on July 6 and became severe during the week end of July 31--August 2. Losses from Rhizoctonia and buckeye fruit rots and from sunscald were worse in dusted than in sprayed plots because the former were on low, poorly drained soil. The first two applications of Bordeaux injured foliage, probably because of chemical impurities. The apparently greater value of C-O-C-S dust over C-O-C-S spray in fruit rot control is believed to have resulted from applying three times more copper per acre in dust form. Any form of copper applied in equivalent amounts (90 pounds per acre) would possibly have been as effective. Resyn adhesive No. 3605 (National Starch Products) at 1/2 pint to 100 gallons was outstanding as sticker for copper sprays, particularly Bordeaux and Tribasic. Armour sticker (1 1/2 pounds to 100 gallons) appeared best for organics. Du Pont spreader-sticker and Triton B-1956 proved inadequate as stickers. Armour sticker (10-12%) is suggested for dust adherence.

Tennessee (J. M. Epps, Test 2). The only disease that appeared to cause any serious damage was early blight, but this did not develop to any appreciable extent until after the end of the harvest period. There was no apparent injury from any fungicides. Weather was not favorable for late blight development.

GENERAL SUMMARY

First Six Materials

Sprays. From the means in Tables 1 and 3, it appears that Dithane Z-78 was somewhat superior to the other dithiocarbamates with regard to yields. However, in eight of the total 13 tests (Tables 1 and 2) in which both Parzate and Z-78 appeared, Parzate plots yielded more than Z-78 plots. Regardless of possible differences between these two similar materials, each of them was somewhat better than other treatments from the standpoint of yield. In the control of defoliation (Table 3) due principally to early blight, there was but little difference among Z-78, Tribasic and Bordeaux. Zerlate was appreciably inferior.

The means of the first five tests in Table 4 suggest that Zerlate, Z-78 and Parzate were about equally effective in controlling anthracnose. However, the data from all of the nine pertinent tests indicate that Zerlate was probably the best of these three fungicides. As would be

expected from previous tests, Tribasic and Bordeaux were rather poor in this respect. Tribasic was best for the control of Septoria leaf spot (Maryland, Tables 1 and 3) and late blight (Table 5).

Dusts. Among dust treatments, (Table 6) Tribasic seemed to be superior to all other fungicides and combinations, particularly in States where late blight and Cladosporium leaf mold were factors in reducing yields. The organic zinc dusts used in these tests do not seem adequate for the control of these two diseases.

Optional Treatments

There are a number of the new fungicides, used alone or in combination with others, that appear promising for the control of early blight and anthracnose of tomatoes. Among the better ones are Zerlate plus Tribasic, Zerlate plus Parzate, Bioquin 1 plus wettable sulfur, manganese ethylene bisdithiocarbamate, Zerlate alternating with D-14 or Z-78, Zerlate alternating with Bordeaux, and wettable Methasan. There are many combinations of other zinc organics and fixed coppers, trials of which may be suggested by these data.